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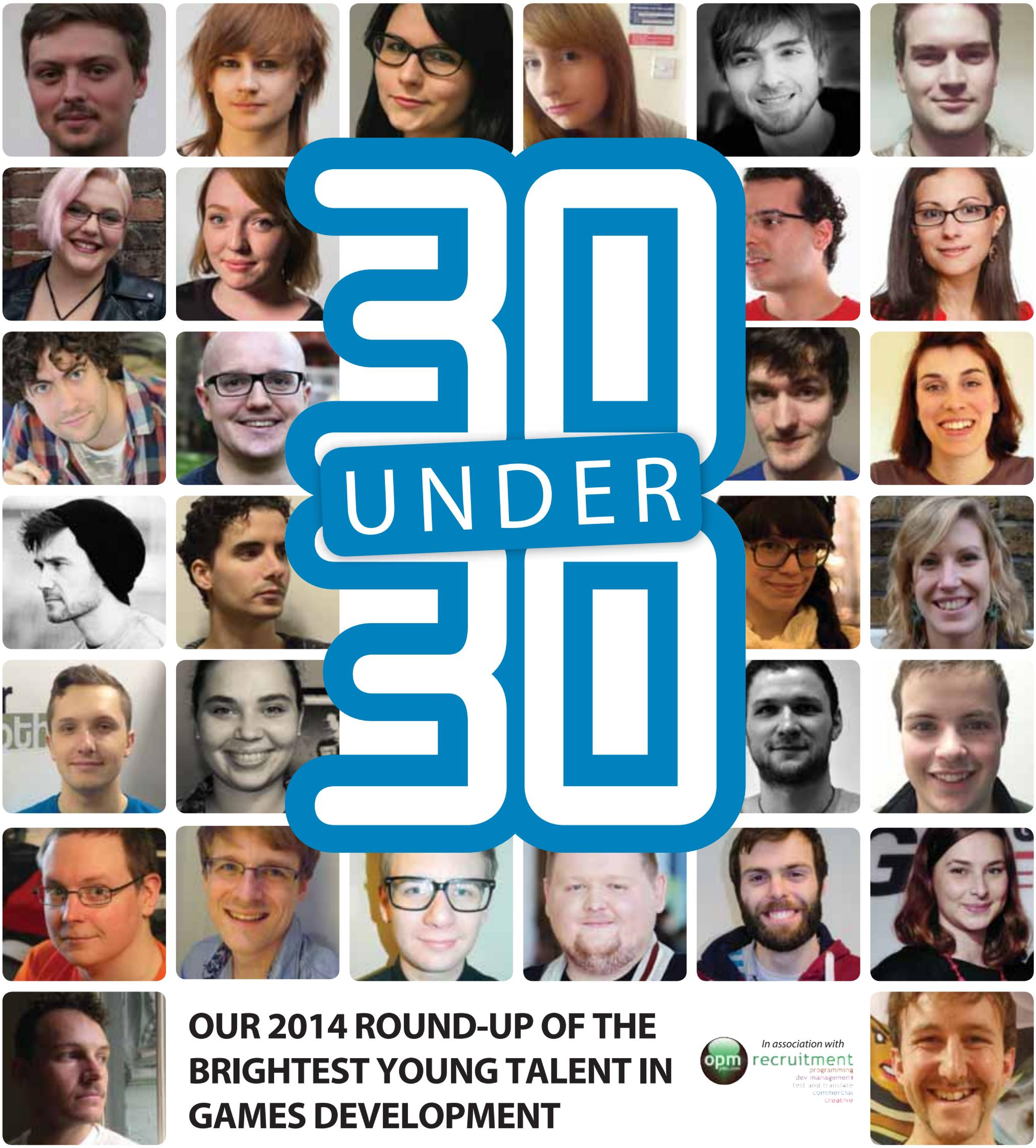

30 UNDER 30

OUR 2014 ROUND-UP OF THE BRIGHTEST YOUNG TALENT IN GAMES DEVELOPMENT

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ISSUE 156 DEC 2014 / JAN 2015

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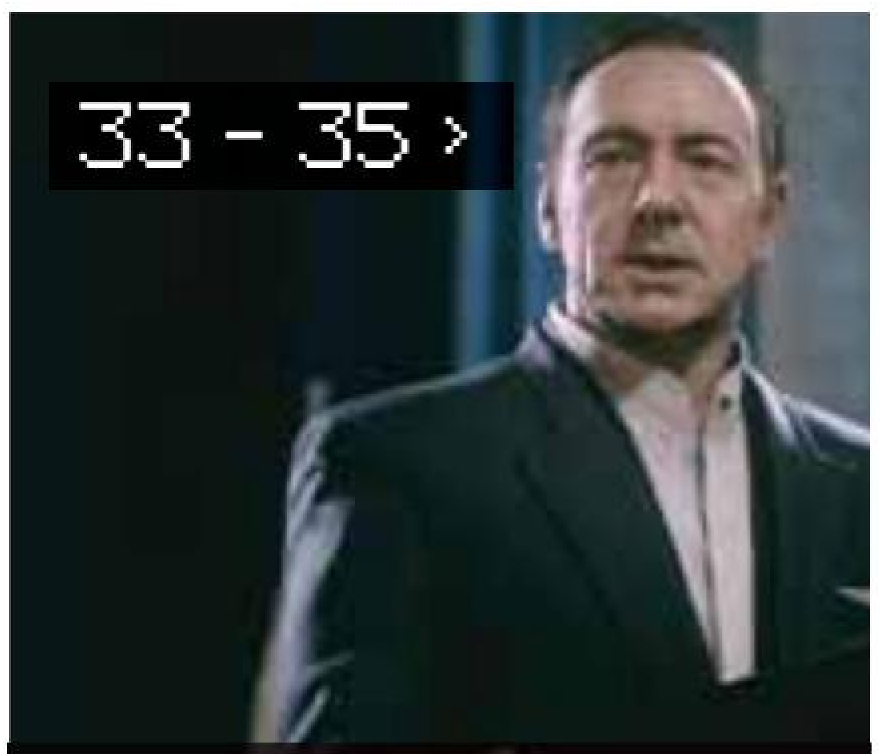
From music to mobile games



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EDITORIAL

WHAT A YEAR

I'LL SPARE YOU the clichéd 'ooh, haven't the last 12 months flown by?' – we're all surprised by the imminent arrival of Christmas and the New Year that always follows it.

But take a moment to reflect on the last year, and I think you'll agree it's seen massive shifts for games development.

Virtual reality further proved its potential and, more importantly, grabbed the attention of the world. Sony joined the push for accessible VR with Project Morpheus, Samsung with its Gear VR, and Facebook purchased Oculus VR for $2bn – still a staggering figure, even seven months on.

On the subject of acquisitions, Microsoft snapping up *Minecraft* creator Mojang was a prime example of how important successful and more innovative developers have become to the wider industry.

The democratisation of video games technology continued, with both Unreal and CryEngine adopting subscription models. The fact that anyone can access such high-end tech for a small monthly fee makes you wonder just how many people out there are trying their hand at development, and what game-changing ideas we'll see from them in the not-so-distant future.

Responsibility for the dominating free-to-play model was questioned, with hints to legislation policing in-game purchases and app stores rethinking how they present 'free' titles.

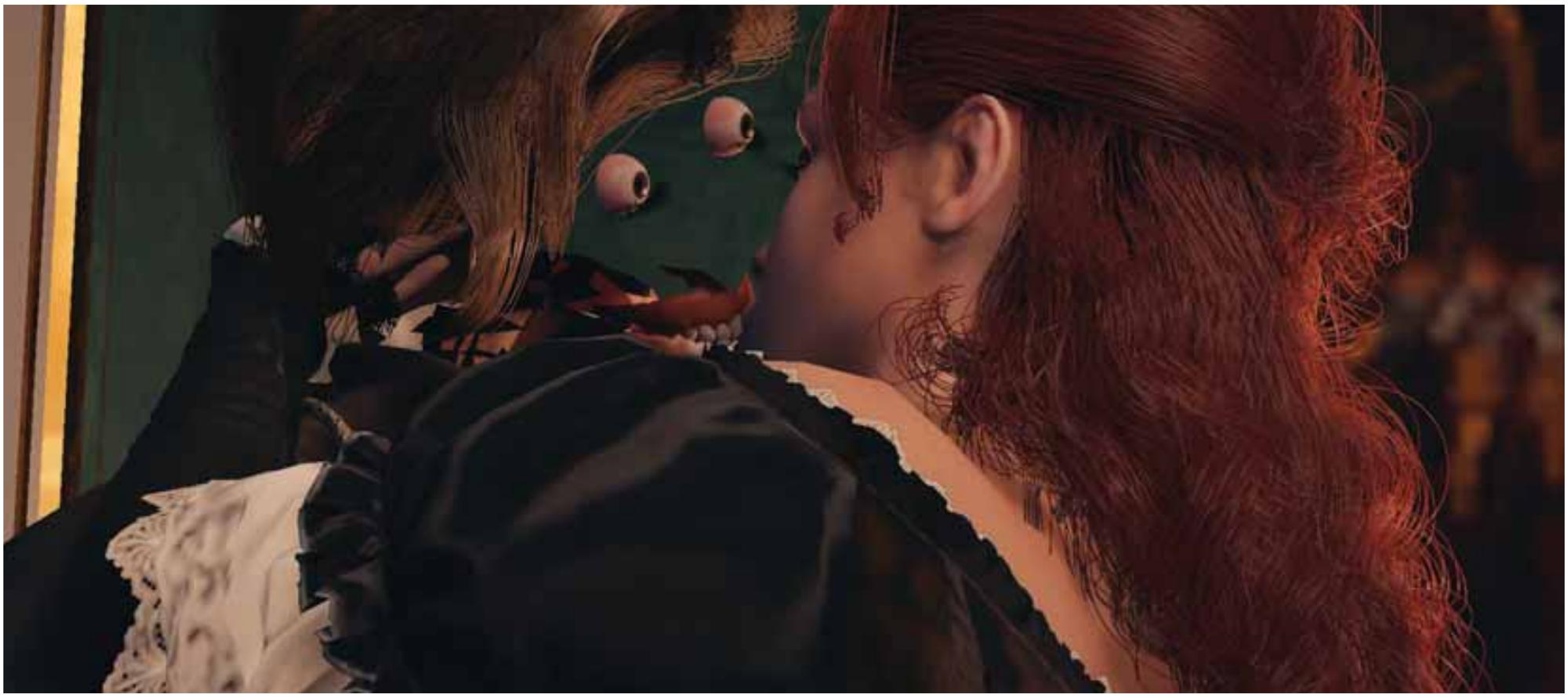
Plus some truly phenomenal games have been released this year, both at retail and digitally for consoles, PC and smart devices.

The point to this mammoth recap? It's been an eventful year for the world of games development. And I, for one, am looking forward to seeing what 2015 holds. Have a great New Year, everyone!

James Batchelor
jbatchelor@nbmedia.com

The face of Day One pressures

Triple-A blockbusters have been lambasted by consumers in recent months as major bugs and glitches have arisen in finished products. **James Batchelor** asks experts about the battle for day one quality



Assassin's Creed: Unity's glaring faults – as pictured above – have drawn more attention to the need for higher quality in the final build of triple-A blockbusters

UBISOFT CAME UNDER fire last month when its biggest release of the year, *Assassin's Creed: Unity*, shipped with some severe quality issues.

If you've been anywhere near the internet, you'll have seen the above pictures of faceless characters and heard tales of NPCs falling through the environment and protagonist Arno failing to enter combat mode in the middle of a battle.

This is by no means solely Ubisoft's problem. Microsoft has been working frantically to fix matchmaking glitches in *Halo: The Master Chief Collection*. Blizzard's *Warlords of Draenor* expansion for *World of Warcraft* disconnected some players as soon as they moved. Troubled Sony racer *Driveclub* continues to suffer a myriad of issues.

These problems are certainly not new – who could forget *Red Dead Redemption*'s donkey lady, or *Skyrim*'s backwards flying dragons? But tempers around *Unity* suggest diminishing consumer patience.

Developers agree that it is impossible to launch a totally glitch-free game, although Bohemia Interactive CEO Marek Španěl says that studios should always endeavour to achieve such quality.

"It was, and still is, relatively simple to make a flawless single-player linear experience, especially when using existing technology and game design rules," he told *Develop*.

"However, with an open world and online experiences, it's more difficult to make the game completely 'flawless'."

Mathieu Lachance, functionality QA manager at Keywords-owned Babel added: "There will always be some bugs left, within or outside of the developer's control. In most cases, a game's quality becomes acceptable for Gold Master status when the ratio of newly-found major issues becomes null and that all known major issues are fixed.

"What is considered to be acceptable, or a major issue, can fluctuate from one person or group to another though. It's not always black and white."

THE ROAD TO LAUNCH

It's easy to say buggy games weren't ready for release, and in serious cases publishers will delay a launch by months in order to give that extra polish. But how much time is required to ensure a game is ready?

"Ideally you want a title to be polished to perfection for release, but this is unrealistic with the reality of release windows and financial pressure," said Testronic operations director Chris Rowley. "It is great when more time is allowed to add in more polish, but often development teams look at this extra time to add in a feature, rather than bug fixing."

VMC's director of business development Ben Wibberley agreed: "You can keep polishing a game almost infinitely but at one point or another developers have to realise that there are other factors that come into play: marketing plans, timelines and budgets. Once all are set in motion, that game needs to go. No one has a magic pot of money; there is the commercial reality of running and funding a studio or game."

> **“It's rare for a launch to be greenlit solely by QA.”**
>
> Nick Barrett, Proper QA

Nick Barrett, who runs independent firm Proper QA and previously ran QA at Electronic Arts and Realtime Worlds, says 'readiness to launch' is "often a business decision now".

"It's becoming rarer for the launch greenlight to be dictated solely by QA," he said. "Or we'd never launch anything.

"It's possible to place a speculative dollar value on each bug we find: how much each bug costs in lost revenue, downtime, dev costs, and so on. Weigh these costs against your projected revenue from releasing now, and see if you can stomach the numbers."

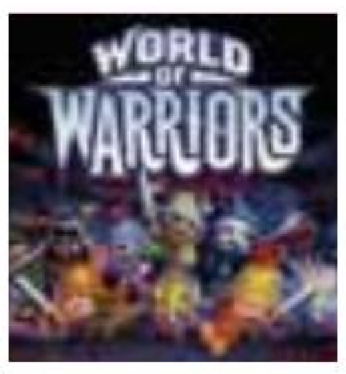
Paul Colls, co-founder at new studio Fierce Kaiju and veteran of Rockstar Leeds and The Blast Furnace, says that the pressures of meeting a publisher's launch window – or even a specific launch date – can be a major factor in the final quality.

"Unfortunately, time can get the better of us," he said. "This is partly why we hear of crunch and unfavourable working conditions. In most industries, you would point the finger at poor planning. Ultimately, though, you need to be pretty damn sure that the player is going to have a great experience – that has to be priority number one.

"The problem is almost always down to money. Dev time costs and hitting your launch window can be crucial: if

// MEANWHILE ON DEVELOP.NET

New Worlds: The vision of Radiant Worlds' new IP SkySaga
deve1op.net/1wT6Ecw



The creative process behind Candy Labs' World of Warriors
deve1op.net/1tLAOsd

develop iPad
Take this issue of Develop wherever you go
bit.ly/1nSKgOe

Microsoft's latest Halo is a prime example of the complications that emerge from online functionality

you miss it, you risk a lot. Not only are you likely to miss out on sales, but you risk stomping on advertising deals, actors and time slots lined up for launch. Not to mention upsetting the people that matter: the gamers looking forward to the title."

PATCH PROBLEMS

The answer for many firms has been the Day One patch, an update that is lined up before consumers have even put the disc in the drive. And Barrett is one of many devs that believes these are a blessing.

"As long as they exist, we will use them just like all the other tools in the box," he said.

"Usually the stuff getting pushed to the Day One patch is a trade-off so that something with a higher priority gets fixed prior to submission or launch."

Lachance added: "Day One patches have a very positive role to play, provided they are not used as an excuse to cut corners. From my point of view, more groups should actually take advantage of Day One patches. They're just one of the tools that helps all parties involved to improve the end product, and video game enthusiasts should actually be happy that devs and publishers care enough to make their products better."

However, Day One patches can be met with negativity from end users – particularly if they involve a hefty download. It is also a tool open to be used for more than just fixes, something that also provokes skepticism from consumers.

> ***We have to recognise customer service is crucial.***
>
> VMC's Ben Wibberley

"Many of the recent issues with these titles seem to be victims of the increase in the patching of key features and fixing severe issues on Day One that are not on the disc," Wibberley explained.

"This practice is common now given the capabilities that digital distribution offers, so really it was only a matter of time until a dev was not able to deliver updates properly on launch.

"We have seen this historically – it just hadn't really reached the prominence in the press that it has recently. One example that springs to mind from last year was where a Day One patch, which added multiplayer, meant one prominent sports game was unplayable for weeks."

Rowley added: "Day One patching has become an industry-accepted way to behave. Better development methodologies and practices would help to improve the situation, but the reality is developers will always push the time to the maximum to make a better product."

Some companies argue that quality at launch has become less important if the title in question goes through an initiative like Steam's Early Access, where it is released in rough form and constantly improved over time.

"Speaking about our own games, day one has become less and less something that matters, as we try to release the game early and support it for a long time after the 'final' release," says Bohemia's Španěl.

"In a sense, the 'release' is mainly a symbol and marketing milestone. *Arma 3* was in an Early Access state for half a year – and you could say it still is over a year later, as the entire development team is still working on it, and improving the game. In this situation, the day one patch is just one of many. We feel such a complex game can be worked on nearly forever and that is can never be truly finished – only abandoned."

AFTER LAUNCH

With developers already striving to ensure games are as polished as possible – even working on patches after the title has gone gold – the only other thing to do is deal with the fallout of any quality issues responsibly. Gamers will complain about broken games, and it's vital to handle such situations carefully.

"Community management is key and rapid development responses showing how much the studio is listening, reacting and truly caring can build trust and enhance reputation," said Lachance.

Wibberley added: "We're now intrinsically linked to consumers and we have to recognise that customer service is now a crucial part of development: it needs to be planned for and that starts during production. What is vital is making sure we maintain the relationships with our players before, during and after launch."

Publishers have responded to recent issues very well. Ubisoft posted a live blog listing all of the *Unity* problems and when they were likely to be resolved, while 343 Industries has kept *Halo* fans regularly updated about upcoming hotfixes. And Fierce Kaiju's Colls predicts this will continue.

"My expectation is that we'll see companies opening up much more, letting both the press and public into the fold much earlier," he said. "We're already seeing it with very public Beta releases these days."

The morale of studio staff is also important. It doesn't take much for the consumer hate surrounding rough launches to penetrate walls, so devs must be ready to deal with it.

> ***It's soul destroying when told your work is poor.***
>
> Paul Colls, Fierce Kaiju

"Developers have likely put a lot into their game, put their lives on hold or inadvertently forced dramatic change in their lives all because they want everyone to enjoy it," said Colls.

"When someone tells you your work is poor, it's soul-destroying stuff. It may well be deserved in some cases, but that doesn't make it any easier. But you have to move on, pick yourselves up and come back stronger, learn from mistakes and don't make the same ones again."

Testronic's Rowley agrees, adding that the best response to a rough launch is to focus on better quality for your next title.

"Ultimately, devs are in control of the quality of their product, especially at the start," he said. "To keep that control, they need to be realistic with their goals, cut features if required to hit their agreed street date, or force date changes if they are outside the publishing window. This will allow them to create a polished title for release – they can always add in features later as part of their DLC strategy."

Left to right: VMC's Ben Wibberley, Testronic's Chris Rowley, Bohemia Interactive's Marek Spanel, Babel's Mathieu Lachance, Proper QA's Nick Barrett and Fierce Kaiju's Paul Colls

DEVELOP DIARY

Your complete games development events calendar for the months ahead

AT A GLANCE

HOBBIT
COMING SOON

DECEMBER 12TH
The Hobbit
Rejoice as Peter Jackson finally finishes his work in Middle Earth. We hope.

DECEMBER 19TH
Night At The Museum 3
Robin Williams' final film hits the big screen.

DECEMBER 25TH
Christmas Day
Not that you could ever forget, what with all the Coke and John Lewis ads.

JANUARY 2ND
Captain Toad Treasure Tracker
Nurse your New Year hangover with Nintendo's charming puzzler.

JANUARY 6TH
CES 2015
What tantalising technological toys does the world have for us this year?

JANUARY 25TH
Burns Night
Brush up on your Scottish poetry and eat haggis.

DIARY DATES

GDC
GDC
GDC
PL300
CC2300
XBOX ONE

GDC 2015
March 2nd to 6th
San Francisco, USA
www.gdconf.org

DECEMBER

NEXT LEVEL CONFERENCE
December 4th to 5th
Dortmund, Germany
www.nextlevel-conference.org

JANUARY

CES
January 6th and 9th
Las Vegas, USA
www.cesweb.org

NEXGEN DEVELOPERS DAY
January 19th,
London, UK
www.globalmgf.com/london/nexgen

MOBILE GAMES FORUM
January 20th to 21st,
London, UK
www.globalmgf.com/london

FEBRUARY

CASUAL CONNECT EUROPE
February 4th to 6th
Amsterdam, Netherlands
europe.casualconnect.org

THE DEVELOP QUIZ
February 18th
Guildford, UK
ABoucher@nbmedia.com

EVENT SPOTLIGHT

CASUAL CONNECT EUROPE

CASUAL CONNECT IS a conference dedicated to the most accessible, broadly appealing games and their developers, with the European edition held in Amsterdam.

The 2014 Casual Connect Europe was attended by over 2,000, and the organisers will no doubt be pushing to improve on that for 2015.

Conference sessions cover a range of topics, from the design and development of casual games, to wider aspects such as best business practices, platform opportunities and monetisation techniques.

Speakers hail from around the world, with last year's notable names including Peter Molyneux, Spil Games CEO Erik Goossens, and more.

The conference provides a great chance to network with companies in this sector, as well as check out some of the most promising indie studios and services companies that exhibit there.

Submissions for speakers are currently open. To suggest a topic, send an email to Tennille Forsberg via tennille@casualconnect.org.

To find out more about the event and its programme, head to europe.casualconnect.org.

COMING SOON

DEVELOP #157:
FEBRUARY 2015

- Develop's Annual Salary Survey: How much are you really worth?
- Recruitment special: Our guide to defining your development career.

DEVELOP #158:
MARCH 2015

- GDC Issue: including our definitive preview of the biggest event of the year.
- Indie Special: How to finance your studio and get your game published.

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Variable declarations

//COMMENT: BUSINESS

Extraordinary games companies: Goodgame

Nick Gibson takes a closer look at the growing European mobile and browser developer

Despite its unusual roots, being founded by a lawyer and a dentist, Goodgame Studios now employs more than 1,000 staff

IN OCTOBER, GERMAN browser and mobile games company Goodgame Studios announced that, having added 400 staff in the previous nine months, its headcount had reached a landmark 1,000.

By my reckoning this makes it not only the largest independent games developer in Germany but one of the largest in Europe – and it is continuing to add 50 new staff per month. I recently had the chance to chat with Christian Wawrzinek, one of the founders, and in doing so got a glimpse into a fascinating and atypical developer at the cutting edge of the business of games. The following profile continues our Extraordinary Games Companies series.

As unusual starts go, Goodgame's is right up there. The company was founded by a dentist (Christian) and a lawyer (his brother Kai) just after the financial crisis in 2009. Remarkably, given the timing, the pair raised €0.5m in bank debt, which it used to help found their games studio and launch a range of lightweight browser games. Neither brother had a history in the games industry and Goodgame was entering a fast growth but hugely crowded browser games market with substantial competition from established and better-resourced market leaders such as Bigpoint and Gameforge.

This baptism by fire helped create a clinical approach to business, which has fuelled the extent and speed of the company's remarkable ascent. The dire consequences of failing to service or repay its original financial debt instilled in Goodgame an acute focus on operational efficiency and profitability from the outset. Being a relatively late entrant into a crowded market forced the company to seek different creative and business paths to its browser game peers.

This quickly resulted in a primary focus on the core browser strategy and MMO gamer, the adoption of sophisticated free-to-play revenue models, massive emphasis on performance-based marketing to acquire customers, and a root and branch application of Google and Amazon's intelligent data-driven ethos. While many companies have adopted similar approaches to development, Goodgame takes this to a whole new level.

Of its 1,000 staff, just 300 actually work in development. Amazingly, a greater number work in its analytics department while a further 100-plus work in marketing.

A GOOD GAME

Goodgame is utterly focused on identifying and enhancing what players enjoy, extending what they are willing to pay for and ensuring a constant flow of new users.

Having demonstrated the viability of a business, which had already reached 100 staff in under two years, Goodgame raised an additional €3.3m in 2011 to accelerate the exploitation of their winning formula. Since then, Goodgame has gone from strength to strength. It recorded profits of €13m on revenues of €102m in 2013, and in just the first half of 2014 has recorded €98m in revenues and €21m in profit.

Although the browser games market has stagnated in recent years and caused widespread problems for many of the market leaders, Goodgame's browser sales have still grown. Stronger growth has been achieved in mobile following the launch of two iOS and Android titles. Mobile now represents 40 per cent of its revenues and will top 50 per cent by the year's end.

Like most of the larger browser games companies, the geographic spread of Goodgame's business is extremely wide, although continental Europe and Germany in particular remain the browser gaming heartland. Goodgame's handling of its diverse user base is also somewhat unusual.

Where most MMOG companies will divide their servers into silos based on language or geographic region, Goodgame uses server silos based on both language and territory, having deduced from its metrics that players engage and spend more when playing with and against players in the same time zone and speaking the same first language.

> **“Of its 1,000 staff, just 300 actually work in development. Amazingly, a greater number of employees work in its analytics department, while a further 100-plus work in marketing.”**

Goodgame is defined by such nuanced understanding of its players and their behaviour. It is telling that one of Goodgame's key expansion plans is to create a new department to study economic theory and practice within its virtual economies. Probably not an idea for start-ups to follow.

Such data-driven, commercially-focused games development can easily risk alienating players and creating bad games. High user ratings and 220m user registrations in just five years say otherwise. Who would have predicted that a German dentist and a lawyer could disprove the myth that too much data always kills a good game?

Nick Gibson is a director at Games Investor Consulting, which provides commercial check-ups, strategy and data to games, media and finance companies.
www.gamesinvestor.com

//COMMENT: DEVELOPMENT

Tear down the walls

Alex Ward discusses how to create the optimal environment for creative games development

Alex Ward says studios should build unique, collaborative and open environments unlike the cluttered desk spaces that decorate many studios

WHAT'S THE IDEAL place to make games? What's the best way to foster community, increase collaboration and build your own culture, goals and ideals? This is something I've spent the last seven years thinking about.

Before I left Criterion, I was the idiot asking people to get rid of their office telephones, removing all of the walls and partitions and clearing their desks of useless clutter.

I always think it's important to bring a clear head and a fresh perspective to each development project each and every day. Making games can be a long, tedious and often arduous march sometimes. It's really easy to get lost along the way. So I am constantly trying to tweak and optimise my day-to-day working experience to be the most effective I can be. I'm still finding my way as to what really works, but I feel like I've had plenty of experience in what doesn't work so well.

Earlier today I was watching a 'making of' video of a much-anticipated upcoming game. There were several shots that showed the team hard at work in their daily office space. It certainly looked familiar. Isn't it a shame that so many studios all look the same? Cram in as many desks as possible, cover them with dev kits and monitors, hire coders and artists, get 'em going. Simple right?

Wrong! This approach causes way more problems than people think it solves.

A COLLABORATIVE ENVIRONMENT

Putting up walls just encourages people to hide behind them. Restrict the amount of open space and you restrict the movement of the folks who have to work there.

A pretty silent office where all the coders are wearing headphones is another telltale sign that something is a little off to me. It bugs me to this day when I see people playing games with the volume muted. Are they walking on eggshells around folks who really don't want to be disturbed by someone playing a game? If you slow down communication, you decrease collaboration.

Making games should never feel like just another job, or a grind or a chore. It's one of the best jobs in the world. We need to celebrate that each and every day. I wish I could say that I lived that experience every day for the past 15 years. I haven't – but I like to think that I really tried to.

With some truly talented and exceptional colleagues, and inspired by Francis Ford Coppola's pioneering film studio American Zoetrope, Three Fields Entertainment founded earlier this year. We work from a small office in the middle of some woodland. Our outdoor space (*pictured*) is incredibly important. We all sit together around a big table. We cook for each other, we eat together.

There are no walls, no barriers, no lawyers or HR staff. It's just about the games. We're about making great games, having fun making them and being empowered to make the right decisions for our games, collectively.

It's a pretty unique and special environment to spend time in. It doesn't try too hard – we're not putting in fake grass, some deck chairs or table football. We're about space, light, air, room to breathe and room to think.

It's a place where we come to do our best work. And this felt like the right choice for us.

If your daily workspace looks no different to what the accountants or lawyers have, then something is wrong. Take my advice, and quit your job today. You're only going to work on so many games during this lifetime. Make each and every one count.

Alex Ward is the co-founder of Three Fields Entertainment. He previously co-founded Burnout games developer Criterion Games.
www.threefieldsentertainment.com

//EXTRA CONTENT ONLINE

"Who wouldn't want their kids to learn and practice these skills whilst being entertained at the same time? Why can't learning be fun? "

Coder demand outstrips supply
Ian Livingstone, Creative Skillset
deve1op.net/1Aa0Grd

"Employing the wrong people is a problem. It impacts projects, revenue and gives you much more work to do trying to resolve the problem."

The pitfalls of building a team
Ella Romanos, Strike Gamelabs
deve1op.net/1oFYXEQ

"Honestly assess your work and compare it to the professionals; if a piece isn't that good, then don't put it in your portfolio."

Tips from an art director
Rick Schmitz, WildTangent
deve1op.net/1zoRlHh

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30
UNDER
30

I hope it's an Xbox One.
I hope it's a PS4.

Happy Christmas.
Here's to bright futures.

The UK video games industry is filled with ambitious young talent who quickly establish themselves within the trade – but which stars are shining most brightly? Get in touch and we'll send you some!

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Why the US rock band has developed its own mobile RPG
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NARRATIVE IN GAMES:
Developers discuss the future of interactive storytelling
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ADAPT'S LOW CARBON FUND:
Teaching games firms more eco-friendly business practices
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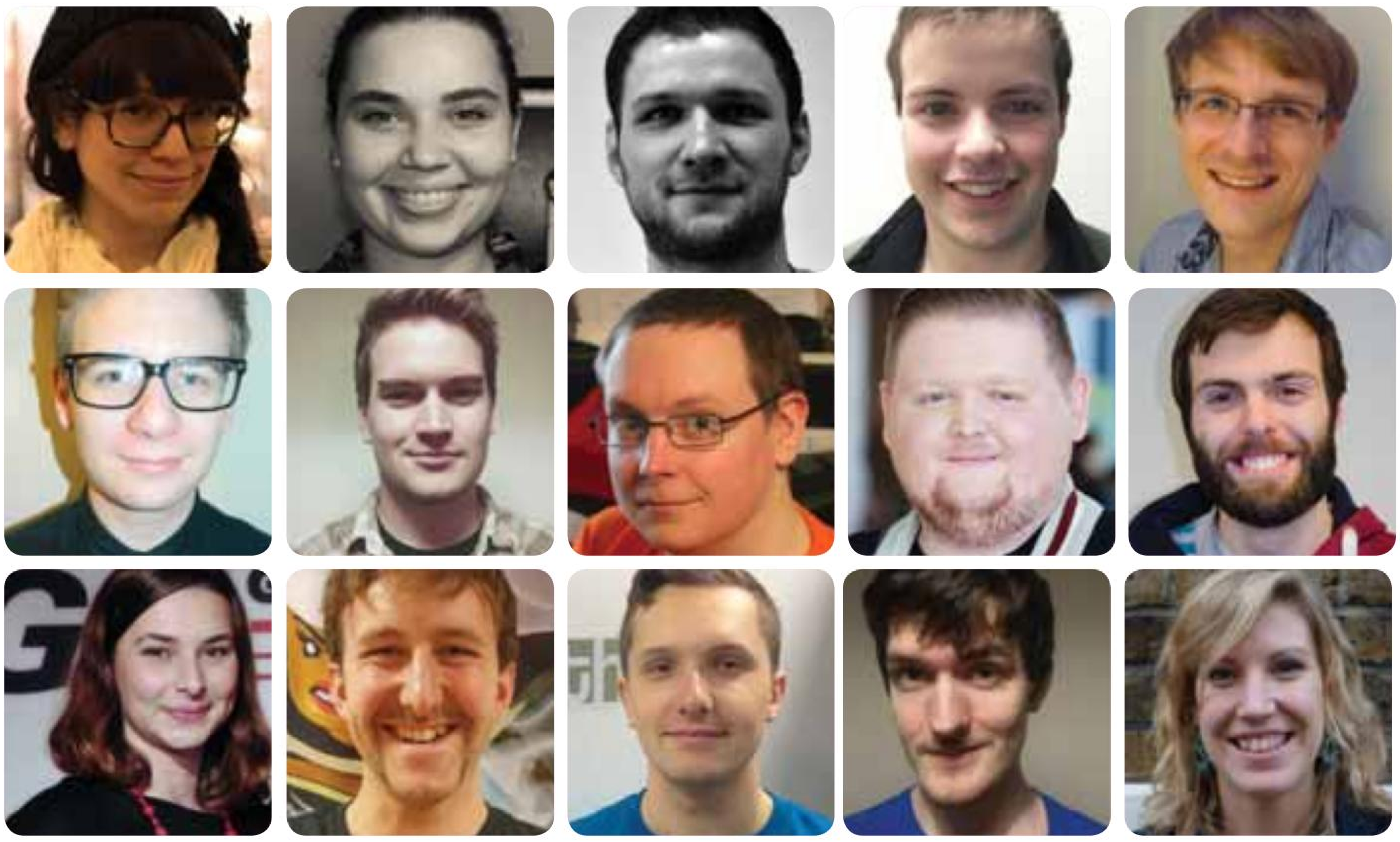
30 UNDER 30

There's a world of promising young developers out there, both already in employment and still studying their craft – and **Develop** has searched the world for some of the very best. Our 2014 round-up of the best and brightest begins on the next page



Michael Webersdorfer
Game developer,
Preloaded
Age: 29

Michael Webersdorfer left his home in Austria to join London studio Preloaded just two years ago, and is already making an impact.

The games developer has worked on projects including *Disney Fairies: Lost & Found* which made its way to the number one kids game on the App Store after release.

Webersdorfer also led its recent cognitive training game *AquaSnap* for MyCognition as technical architect, showing his quick progression at the company. His colleagues also praise him for his outspoken manner and ability to assist the technical director on complex tasks.

Jordan Amaro
Designer,
Kojima
Productions
Age: 27

A 2K and Crytek UK alumnus, Jordan Amaro moved to Kojima Productions in 2013 and is the only foreign designer currently working on the *Metal Gear Solid V* team.

But not forgetting his UK roots – despite the chance to work on one of the biggest game franchises in the world – Amaro has also held talks in London on the state of the stealth genre and advised indies at GameCity.

He also mentored children at the Games Britannia festival in Sheffield, keen to spread the vast knowledge he has already accrued in the sector despite his young age.

Michael Cameron
Games designer,
Blazing Griffin
Age: 25

Blazing Griffin games designer Michael Cameron has a rapidly growing portfolio of games, including match-three mobile puzzle *Dino Tribes,* which he pitched and won funding for through AppCampus.

Not just content with developing games, during his time at the University of the West of Scotland, where he studied Computer Games Technology, Cameron was also selected to join Windows Games Ambassadors, giving a variety of talks, writing articles and organising game jams and Unity porting events.

Cameron is currently hard at work on the upcoming *Distant Star: Revenant Fleet* for PC.

Helana Santos
Technical
director,
Modern Dream
Age: 29

Formerly a tools programmer at Blitz Games Studios, Helana Santos is now the technical director at Modern Dream, which she founded with developer Ollie Clark.

Santos has worked on indie titles including *LA Cops, The Cat that Got The Milk* and *The Button Affair*. In addition, Santos is also one of the founders of the Arch Creatives, which provides a shared creative space for indies, and also works as a Video Game Ambassador, regularly giving talks and workshops.

On top of all this, she is now a member of the UKIE board representing the interests of small studios.

James Dobrowski
Production
director,
Mediatonic
Age: 29

Despite only entering the games industry in 2011, James Dobrowski has already earned the role of production director at Mediatonic, having previously led production on *Forza Horizon* at Playground Games.

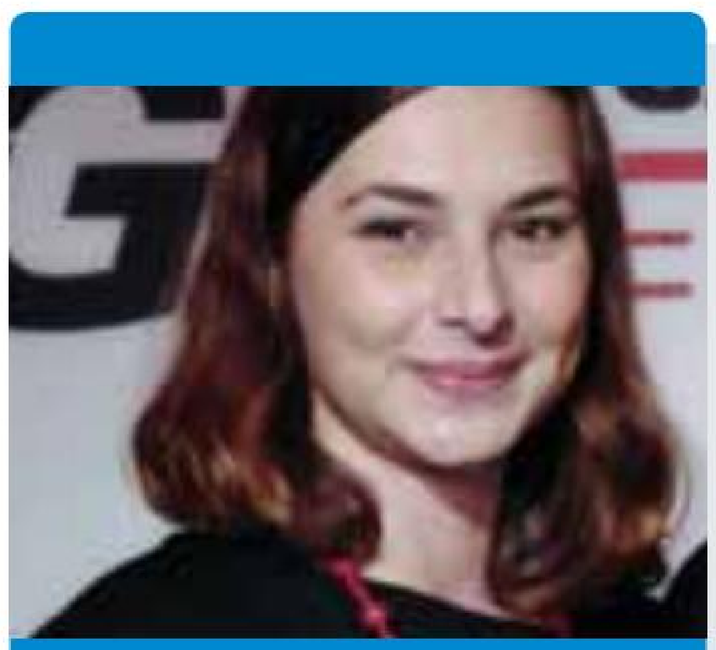
Now leading the production team at Mediatonic, Dobrowski overseas the delivery of a wide range of digital games across the studio. Within two months of joining the team, he quickly made an impression by building relationships with some of the largest publishers in the US and Japan, and has overseen the soft launch of two of the studio's biggest mobile titles.

Shaun Spalding
Indie developer
Age: 25

Shaun Spalding graduated from Teesside University in 2011, winning a sponsored award in game design at its end of year show Expotees, leading to an internship at Ubisoft Reflections where he worked for two years.

Spalding has since moved on to go it alone as an indie, but continues to win accolades for his work. The developer recently released the award-winning puzzle platformer *Another Perspective*, which successfully made its way through Steam Greenlight.

He's also keen to educate others, too, releasing a series of 'Making Games' tutorials on YouTube.



Roberta Saliani
Director and head
of production,
Just a Pixel
Age: 24

Roberta Saliani is the co-founder of *Light* developer Just a Pixel, a title that went to Kickstarter and was later picked up by Team17 to publish.

Under Saliani's stewardship, the fledgling studio has already received a nomination for the Start-up Award from TIGA. She has also helped manage the studio's steady growth and move the company from a single room start-up in a flat to its very own office.

Not just limited to Just a Pixel's own IP however, Saliani's team's credits also include work with Sony, Activision, Somethin' Else and Mike Bithell.

Jack Attridge
Game designer,
22Cans
Age: 25

Jack Attridge graduated from a film production degree with various film-making awards including a Royal Television Society award, spending years as an audio designer.

Attridge cut his teeth at EA Bright Light, before moving on to Rebellion and Mind Candy. He was then approached by Peter Molyneux to join him at new studio 22Cans as a game designer, working on titles such as *Curiosity – What's inside the Cube?* and *Godus*.

Despite being just 25, Attridge's quickly accumulated experience at some of the UK's biggest games companies ensures he is one to watch.

Caitlin Goodale
Graphic designer, Lift London
Age: 21

Caitlin Goodale is a graphic designer at Microsoft's Lift London studio. She joined after graduating from the University of Abertay where she studied Computer Arts.

During her time there she made indie titles as part of Abertay's Game Development Society, one of which won an award at TIGA's Gamehack 2013. Goodale also obtained experience after her first year through an art internship with *Minecraft* Xbox 360 edition developer 4J Studios, where her work earned her the studio's Intern of the Year award, before also going on to win an IGDA scholarship at GDC 2014.

Karen Garcia Teixeira
Game artist, Bossa Studios
Age: 28

Despite living in Brazil, Karen Garcia Teixeira decided to up sticks in 2012 and join London-based developer Bossa Studios, working on the likes of *Merlin: The Game* and *Twelve a Dozen*.

Her many talents include character design, UI and drawing up visual art styles, and her impressive work at Bossa has ensured she's never looked back since the big move.

Away from development, Teixeira is keen to encourage other people to get into programming, starting her own coding blog and sharing her experience and resources with avid readers.

Amy Florence Stevens
Team lead and technical artist, Five Pixels
Age: 20

Described as a bright and passionate artist who is not afraid to push herself, Amy Florence Stevens is the team lead and technical artist at Five Pixels.

Stevens led her team at the Dare to be Digital 2014 games-making contest, and her work on the art helped the team earn the Artistic Award for its title *Seek*, an experimental game that requires users to move the tablet to venture around the game's world. The title was also later awarded Best Student Game at the TIGA Awards 2014, marking a quick string of accolades for this gifted young artist.

Matthew Lightfoot
Associate producer, Bohemia Interactive
Age: 22

Matthew Lightfoot only started working in games in 2012, but at the age of 22 has already made waves at studio Bohemia and the industry in general.

He was one of the key members on the hit *Arma 2* mod *DayZ*, which is now being turned into a full standalone title, on which he worked as the sole member of the production team through the majority of development before alpha release.

Lightfoot is now associate producer on *Arma 3*, and is described as someone who has a great sense of humour whose attitude and communication skills are unparallelled.

Samuel Read
Director and co-founder, Hypersloth
Age: 23

Despite only being 23 and still studying his degree at University, Samuel Read has already been busy forming his own studio, Hypersloth, working on Steam Early Access game *Dream*.

Not just content with his own IP and studies, Read has also worked on the BAFTA-nominated *Splemy, Gravity Animals* and another Early Access game *Gang Beasts*, as well as designing educational game *Research Rampage* for the European Union.

With such an impressive portfolio already, Read appears destined for even more success thanks to his talent and hard working attitude.

Andrew Maximov
Senior artist, Naughty Dog
Age: 24

Already receiving numerous accolades during his short career, such as the Grand Prix by the Montreal International Game Summit Art Gallery, Andrew Maximov has become a senior artist at Naughty Dog.

Starting his career at Wargaming, he is now tasked with the technical art for *Uncharted 4*. But not just proficient in art, Maximov is also fluent in numerous programming languages, making him an ideal technical artist and shader programmer. Maximov is also known for his GDC sessions, and his education DVD *Physically-Based Rendering for Artists*, circulated around numerous triple-A studios.

Jessica Kelham
External producer, Team17
Age: 29

A key player in Team17's third-party publishing business, Jessica Kelham has proven her ability and worth since joining the *Worms* developer in 2008.

Having worked her way through the ranks, Kelham is the lynchpin between third-party devs and Team17's publishing team.

According to her colleagues, Kelham is able to inspire any team she works with to deliver high standards and ensure games meet their deadlines and budgets while also being a delight to work with and acting as a role model for junior team members and women in games.

Alice Rendell
Game designer, Kobojo
Age: 27

Commended for her passion and hard work, Alice Rendell is a promising games designer currently working at Kobojo.

Having spent over three years at the firm's Paris HQ, she returned to Dundee earlier this year to work on *Zodiac*, a JRPG co-developed with former *Final Fantasy* staff.

Prior to Kobojo, she worked at Facebook games specialist Ooblada and offered consulting advice on game design at studio We Move Beyond.

To this day, she continues to write articles and give lectures offering game design tips to new developers.

Andy Touch
EMEA product evangelist,
Unity Technologies
Age: 24

Andy Touch is a member of Unity's evangelism team and can often be found travelling around Europe, visiting different development hubs to meet new studios, answer their questions and offer workshops on how to use the popular game engine.

Described by colleagues as "endlessly enthusiastic and very professional", Touch is praised for his deep understanding of how important it is to work with communities.

A graduate of Bournemouth University, the 24-year-old has been at Unity less than two years, but already feels like a long-running member of the team.

Anna Tito
Gameplay engineer,
Gameloft New Orleans
Age: 29

Anna Tito's games development journey began at Kixeye Brisbane, where she was hired as a gameplay engineer for space strategy title *Vega Conflict*. Her work overhauling the UI framework quickly gained her more responsibilities, as well as the attention of other organisations.

She was nominated for the GDC Women in Games Rising Star for two consecutive years, and Pollenizer named her one of Australia's Top 50 female programmers. This year, Tito was being headhunted by Gameloft New Orleans, where she has taken a central role in the studio's development process.

John Ribbins
Creative director,
Roll7
Age: 29

Starting at Rolling Sound, Ribbins began his career teaching underprivileged young people how to develop video games. This initiative led to the creation of *DeadEnds*, a game developed with those students to highlight the issues of gang and knife crime.

In 2008, Ribbins helped found Roll7, taking on the creative director role he still holds today. The studio's biggest hit *OlliOlli* originated as one of his numerous experimental personal projects.

He is currently working on *Not A Hero* with artist Jake Hollands, a title that won IGN Best In Show awards at E3 and PAX East.

Alex Felton
Game balancer,
Goodgame Studios
Age: 25

Like many developers, Alex Felton started out in QA, most notably as a QA engineer for Microsoft. His passion for games development and hard work saw him advance to better things very quickly, with Felton currently working at German firm Goodgame Studios.

In his role as game balancer, he is entrusted with monitoring and maintaining the economy and PvP systems on some of Goodgame's flagship titles. In particular, Felton's peers praise his "drive to improve the systems throughout the games he works on" and predict he has "a bright, glowing career ahead of him".

Diego del Pozo
Online programmer,
Ubisoft Reflections
Age: 28

Spanish ex-pat Diego del Pozo began his development career after earning a Masters degree in the US. After some time making games Stateside, he moved to the UK and gained experience at Playground Games before joining Ubisoft's Reflections studio.

He was a key member of the *Just Dance 2015* team before honing his skills as a dedicated online programmer. His peers describe him as dedicated and knowledgeable, championing del Pozo's ability to learn new skills such as Python coding very quickly, as well as his analytical and thorough approach to problem-solving.

Michael Brown
Director & developer,
Boneloaf
Age: 29

A fiercely ambitious independent developer, Michael Brown is one of the leading forces at promising indie studio Boneloaf. The company is currently working on its first game *Gang Beasts*, which is due to be released on Steam Early Access soon. The title has garnered plenty of coverage from the games press and even YouTube king PewDiePie.

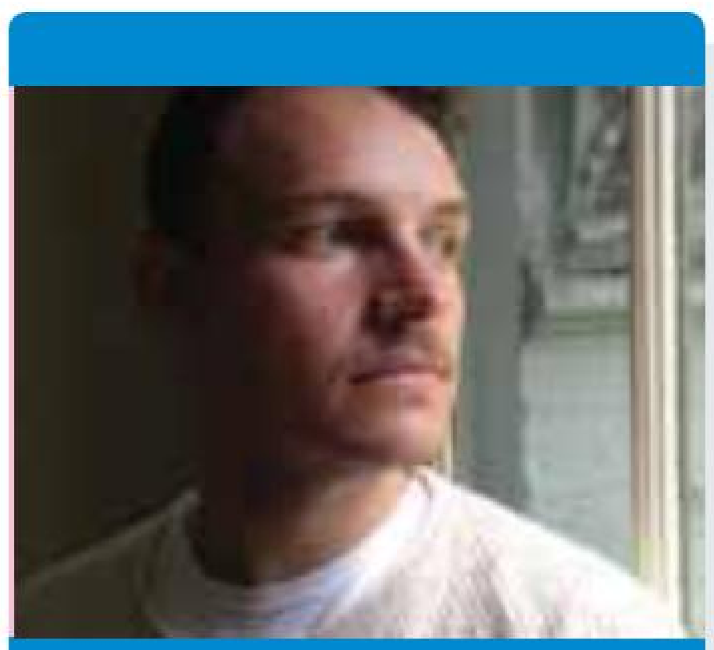
In addition to the game's overall development, Brown has worked on the characters and environments, as well as level design. Praised for his "drive and pure inventiveness", peers expect Brown to go a long way in the games industry.

Matt Zanetti
Chief creative officer &
co-founder,
Guerilla Tea
Age: 28

Not only is Matt Zanetti a co-founder and CCO at Scottish indie Guerilla Tea, he was also the studio's sole artist before helping to build and manage the growing art department.

Starting out as an interior architect, Zanetti transferred his skills to game art, mastering the disciplines of 3D hard surface modeling, 2D and 3D character creation and animation, and more.

Zanetti also helps with the education of future games developers as an advisory board member at Glasgow Caledonian University, a contributor at Escape Studios and participant in yearly project briefs at Abertay University.



Trent Charles Kusters
Founder & director,
League of Geeks
Age: 28

Trent Kusters is a champion for independent developers. In addition to his work at the League of Geeks – a collective of Australian indie devs – he is chair of the Freeplay Independent Games Festival, and was also named as one of Australia's 25 Top Young Achievers by Triple J back in 2010.

He is also an industry advisor to various universities, as well as the film, theatre and design industries and the local and federal government.

Prior to the League of Geeks, Kusters worked as creative director at Divisive Media and design director at Torus Games.

Richard Hole
Producer, Frontier Developments
Age: 29

Following university, Richard Hole started out as a tester at Rockstar, working on *GTA IV* and *Midnight Club LA*. He moved to Frontier Developments as a senior tester, rising to lead tester for Microsoft's *Kinectimals*.

In November 2010, he moved into production, starting out on *Kinect Disneyland Adventures*, going on to help with *Kinectimals: Now With Bears* and Xbox One launch game *Zoo Tycoon*. He is currently working on new IP *ScreamRide*.

Hole is described by colleagues as "an exceptionally hard working professional with a positive attitude and a wealth of experience".

Alex Grahame
Junior environment artist, The Chinese Room
Age: 24

Alex Grahame graduated from Abertay University earlier this year, completing her course in Computer Arts. Her final year's work demonstrated her ability to work to the standard of triple-A games development, catching the attention of various studios.

As you would expect from an Abertay student, she entered various game jams, including Dare To Be Digital, with projects such as *Food Frisbees* and a Havok-powered 3D third-person action game. She is currently working in her first post in the games industry as junior environment artist at *Dear Esther* creators The Chinese Room.

Nick Taylor
Operations manager, Playmob
Age: 21

One of the youngest entries in this year's list, Nick Taylor is currently operations manager at charity games firm Playmob, having joined the studio back in 2012. The youngest member of the team, he works with the CEO to plan company operations and oversees the firm's day-to-day affairs.

Described as "creative, entrepreneurial and dynamic" and someone who "thrives on challenges", Taylor has impressed his colleagues and adapted as the company has grown. He even shows passion for the studio's charity operations by also volunteering with SpecialEffect.

Maria Novisova
Associate producer, Climax Studios
Age: 27

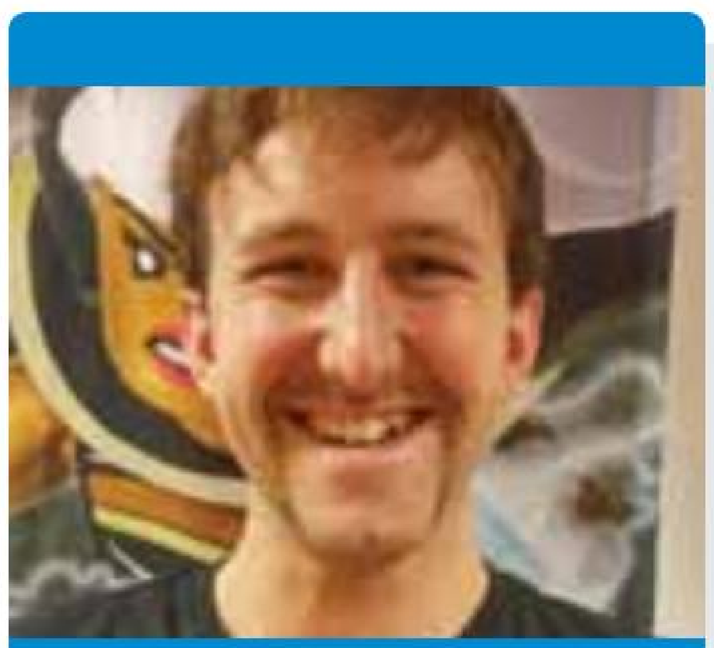
Joining Climax in 2013, Maria Novisova has been instrumental in strengthening the studio's production department and developing *Bandit Six*, the firm's first virtual reality game for the Samsung Gear. She is currently producing an unannounced action game for PS4, Xbox One and PC, overseeing the title from inception to launch.

Described as "Climax's best kept secret production weapon", Novisova is praised for her diligence, organisation and 'creative sparkle'. Her team commend the way she motivates those she works with and ensures her projects are kept on track.

Steph Gadd
Marketing & events assistant, Marmalade Technologies
Age: 24

Having spent just over a year on Marmalade's marketing team, Steph Gadd is already a firm fixture after throwing herself into the work from her first day. Described as "calm, diligent and full of ideas", Gadd has worked hard over the past 12 months in liaising with developers, reviewing content and writing Marmalade's weekly Featured Apps blog.

She has also been responsible for the organisation of multiple developer events and is Marmalade's "social media queen bee". Her catchphrase of "yep, no worries" shows how eager she is to help both her colleagues and the developers she works with.



Sam Hughes
Junior sound designer, Traveller's Tales Games
Age: 26

A graduate from the University of Huddersfield, Sam Hughes followed his studies of music technology and audio systems with freelance sound design work, contributing to short films, feature films and other projects, before landing a job at TT Games.

In 2013, he was one of the first three people to be awarded the Prince Williams Scholarship by BAFTA and Warner Bros, going on to study Post-Production with Sound Design at the University of York. Hughes also runs the Sound Architect website, which reviews games with a particular focus on audio.

HONOURABLE MENTIONS

Unfortunately, it's just not possible to list everyone nominated for 30 Under 30, so here are the worthy contenders that didn't make the final 30:

James Cubitt, Universally Speaking; **Daniel Murray, Duncan McKinnon** & **Pete Ellis**, Frontier; **Danny Goodayle,** Just a Pixel; **Gary Lloyd,** Sigtrap; **Josh Naylor,** Unity; **Callum Underwood,** Oculus; **Andrew Robinson,** CCP Newcastle; **Lee Vermeulen** & **Jesse McGibney,** Alientrap; **Stephen Sharples,** TT Games; **Joe Grainger,** Torque; **Simon Fox,** Playlab London; **Jon Reid,** Preloaded; **Michael Barclay,** Cloud Imperium; **Tom Vian,** SFB Games; **Richard Pring,** Wales Interactive; **Andrew Wallace,** Golden Ruby Games; **Laurence Whaites,** Fierce Kaiju; **Scott Downie, Ian Copland** & **Nicolas Tanda**, Tag Games; **Jordi Fine,** Budge Studios; **Harrison Baker,** Testology; **Benjamin Robert,** Ubisoft; **Jamie Keddie,** 4J Studios; **Gareth Gray,** Iglu Media; **Maksims "Max" Mihejevs,** PlayCanvas; **Rob Whitehead,** Improbable; **Lucy Morris,** independent; **Robin Silcock,** Norwich Uni; **Joel Jucom**, SplitMedia Labs; **George Buckenham,** independent; **Dan Fountain,** State of Play; **James Whitehead**, Boss Baddie; **Jack Jones**, Sheridans; **Martin Grant** & **Kenneth Mason**, University of West Scotland; **Brian Beacom, Kenneth Mackinnon** & **Charlie Czerkawsi**, Guerilla Tea; **Rich Court**, The Chinese Room; **Andrew Booth**, D3T; **Craig Yates** & **Joel Atkinson**, Hardlight; **Daniel Falconer,** Future Fossil; **Elizabeth Mercuri,** Prince William Scholarship; **Philip Bielby, Chris Long** & **Jamie Brooks,** Jagex; **Hamid Homatash,** Outplay Entertainment; **Richard Weaver,** Evolution Studios; **Joe Brammer,** Deco Digital; **Mike Pickton** & **Dan Bradshaw**, Ubisoft Reflections; **Derek De Filippo** & **Travis Winstanley**, Kuju; **Matthew Rudman**, **Jamie Grossman** & **Matt Teague**, Marmalade; **Lukas Roper,** Opposable Games; **Dan Walters,** Calvino Noir; **Rob Williams,** Ripstone; **Haydn Peterswald,** Eutechnyx; **Eamonn Van-Harris,** Avatar; **Alex Francois,** Brainchild; **Matthew Skingle,** DR Studios; **Erik Hittenhausen,** Testronic; **Adam Fletcher,** Mediatonic; **Nareice Wint,** Route 1 Games; **Peeyush Gulati,** Ubisoft Abu Dhabi; **Nicolas Duclos, Sean Noonan** & **Ambre Lizurey,** Ubisoft Montreal; **Kobe Sek** & **Alan Frazier,** Ubisoft Singapore; **Yip Kayan,** DigiPen; **James Cox,** USC; **Sos Soswoski,** independent; **Shai Magzimof,** Nextpeer; **Aurora Klaeboe Berg,** Dirtybit; **Jack Gillespie,** Well Placed Cactus; **Joaquin Molina,** Nurbs Studios; **Josh Caratello,** OrangeCore; **Laila Shabir,** Girls Make Games; **Alan Saari,** Gwythdarian; **Ashton Andersen,** Virtual Basement; **Christos Reid,** independent; **Floyd Chitalu** & **Stephen McGroarty,** Codeplay; **Bruce Slater,** freelance; **Greg Pryjmachuk**, MinskWorks; **Bernard Francois**, Preview Labs

Rocking up **on mobile**

US rock act Avenged Sevenfold has released its first mobile game, but this is no licensed product – it's a fully-fledged RPG featuring music and artwork from the band's albums. **James Batchelor** talks to frontman Matt Shadows about the group's games development debut, its inspiration and future games ambitions

Avenged Sevenfold vocalist Matt Shadows (above and main) says he took the lead on the game's development

What was the band's involvement in *Hail to the King: Deathbat*'s development?
We came up with the initial concepts: everything from level design to the weapons and powers – even things like what we wanted from the controls and mechanics, making sure that playing as the main character felt good. I also gave my feedback on what needed to be changed. Basically I took a lead on it without any real programming skills.

Where did the idea first come from?
Everyone who grows up as a gamer wants to make a game themselves. Initially, I wrote a triple-A game. I read a bunch of books on how to write game design documents, and wrote one myself.

I'm friends with the guys at Treyarch and they quickly squashed my idea. In terms of the GDD I showed them, they were like 'this would cost hundreds of millions of dollars – you should try a mobile game first'.

I brought the idea to the rest of the band. Most of our fans have smartphones at this point so we wouldn't be alienating anybody.

Why write the GDD yourself?
It's a very sensitive subject: being a band and doing something like this. A lot of people will call you a sell out and want to knock it down as soon as it's out, and we've seen that with a lot of the reviews. They don't understand where we're coming from, they have no clue that we've made the game ourselves, but a lot of them label us as people that will licence our name out and have nothing else to do with the final game.

> ***"Treyarch said 'this would cost hundreds of millions of dollars – you should try a mobile game first'."***
>
> Matt Shadows, Avenged

We've been very clear in the press that we made this game ourselves. Our mascot, our logo and what we do is very important to us, so we want to make sure it comes directly from us, not some developers that know nothing about us.

How much did you know about games development beforehand?
I'd been to Activision and to Treyarch when they were making *Black Ops* and other games – but you never really know until you try it yourself. It looks all clean-cut when you're visiting, but you're not in the meetings, you're not among the 200 people caught up in a process where fixing one thing breaks everything else.

So what help did you have development?
I had a buddy who was doing music for mobile games, and Mark Lamia at Treyarch had already suggested we do a mobile game, so I thought I'd talk to those guys. I met a guy named Matt Newman, and he had a programmer named Michael Stragey, who had just come over from consoles to mobile. I took a look at the games they'd already done and we really hit it off.

So I had a programmer, an artist and myself. The three of us worked on the game for two and a half years, until it was done.

How did you fit it in around your activities with the band?
We came up with the idea while we were writing the *Hail to the King* album, and then we had months off at a time where I could focus on the game. Matt and Michael would work on it six days a week, and I'd come in three days a week. And then when we were on tour, I'd get them to send out builds to

Matt Shadows originally wanted the game to be developed for console, but high triple-A costs meant he was advised to release on mobile

me. Then I'd tell them what was wrong, what we needed to fix.

Did anything surprise you about the experience and the development process?
One of the things that I learned was simpler mechanics and a simpler game can sometimes be more fun. Having a lot of cutscenes and the movie-like hand-holding experiences you get from games these days – especially the triple-A – is not really something I personally want. For me, it's all about having a great idea first.

We were almost playing a game of Jenga at one point, because we started with a simple game but as we kept going, we kept adding and adding – that's not a good way to design a game. You're going to cause you a lot of problems, because if you're changing a year into development, it causes a lot of other problems.

How well has the game performed so far?
The mixed reviews have come from the press, but the fans love it. I was actually really surprised, because the first review I saw was a really snarky one from someone who just wanted to trash it and didn't understand it. They were acting like it was supposed to be a *Diablo*-style game, but that's not what the game is. So I woke up in the morning thinking 'great, here it starts'.

It still sits as a 4.7/5 on Android, and it's got over 3,000 reviews. And then on Apple it goes between 5/5 and 4.5/5. So the reception from the fans and the people playing it has been very positive.

It's kind of like our music, it's very polarising. You either love it or you hate it, and there's really not a middle ground – and we wouldn't expect any less.

Most licenced games on mobile seem to be endless runners, *Clash of Clans* clones and so on. What did you do to make sure you stayed away from that?
I'm just not a fan of those games, so I had no interest in making one. And more importantly we didn't want to nickel and dime our fans. I just don't think it's right – especially coming from a band.

We had to be smart about this. We put all of our own money into this game. We built it ourselves so we charged a premium price that we thought was fair. And we didn't just pull that price out of our ass: we let Apple and Google play the game, and they thought it was actually underpriced for what it was.

> ***"Making a game isn't necessarily the best business move for us, but it was a cool move and something fun."***
> Matt Shadows, Avenged

I'm 33 years old, so I come from an old school mentality. I understand going to the arcades and putting quarters over and over again, but that's different from nowadays when some games constantly ask for money and throw ads at you.

So what games inspired *Deathbat*?
I personally don't like the whole *Clash of Clans* scenario where you have to wait until the morning to take your turn, and stuff happens offline.

I prefer indie games like *Super Meat Boy*, as well as classics like *Contra*. That's a very simple game; you get hit by one bullet and you're dead. Super simple mechanics but very difficult gameplay that you can get good at. Those are the type of games I was looking at.

I even threw a little *Mario* in there because his arsenal was really simple: he had a flower, a star or a mushroom. It's not like there's a system with more armour, more flowers and so on. I like the old school ethos of 'you get what you get' and you just have to get better.

What was the hardest part of development?
Not having exactly what we wanted sussed out from the beginning. We knew we wanted to make a game within the confines of mobile, but we kept making it bigger to the point where we had trouble with optimisation.

We made mistakes. The game was built so organically, and the levels are so big – I now understand why in some games you're walking into the same room over and over again, because they're reusing textures.

We had to do so much optimisation at the end that I wasn't sleeping at night – I didn't know how the game was going to fit on mobile. We'd been building it for two years and it didn't look like it would work. And Apple wanted it to run on the 4S otherwise they wouldn't promote it – there were all these issues we were dealing with. I wish we'd sussed it out a little better at the beginning, and on our next one we will.

Would you encourage other bands and music acts to explore what games can do?
Making a really difficult mobile game isn't necessarily the best business move for us, but it was a cool move and something fun for the fans. I wouldn't necessarily dissuade people from doing this, but if you're passionate about games, it's awesome.

Telling **Tales**

Storytelling is becoming increasingly important in the world of games as the medium continues to evolve. **Craig Chapple** talks with the industry's leading writers on where strong narratives can take games in future

Top to bottom: Failbetter CEO Alexis Kennedy and Storm in a Teacup co-founder Alberto Belli

Main: BioWare RPG Dragon Age: Inquisition

STORYTELLING IN GAMES today is a big deal. Naughty Dog's critically acclaimed *The Last of Us* told a gripping story and presented character development and layered emotions on a level rarely seen in the medium.

And it's not the only blockbuster to focus on narrative. The *Mass Effect* trilogy's focus on story and player choice was its key hook, and *Skyrim* was filled to the brim with rich history and a variety of side stories engrossing the player in its vast world. Numerous other titles such as *The Stanley Parable* and *Gone Home* are also pushing the boundaries of storytelling in games.

Not all games focus on narrative, of course. Take *Minecraft* for instance: the title is about doing whatever you can imagine, rather than leading players down a set path and explaining their surroundings. But for many games it's becoming increasingly imporant.

A UNIQUE PERSPECTIVE

"I think a larger number of developers are pushing at the boundaries of what game narratives are thought to be capable of, so expectations on game narratives in general is raising, and thus, yes, more importance is being placed on them by developers," says *Dragon Age* lead writer David Gaider.

Today, stories in games are told in numerous ways. From the narrow storytelling structure of the *Uncharted* and *Last of Us games*, the branching narratives of big RPGs such as *Skyrim* and *Mass Effect*, user-generated stories in the likes of *Eve Online* to episodic stories used by Telltale, a plethora of methods to structure narrative in games have emerged.

But this brings up its own challenges. While TV and film can focus on the characters and the core plot, getting from A to B seamlessly and quickly, games are ultimately about the gameplay, and the journey is a key part of the experience. Where other mediums can skip scenes – when going from the bottom of a building to the top, for example, game players often must go through the entire journey.

"In a game, you're going to have to allow for player agency – the player needs to exert some control over the narrative's direction, if the game allows for it, and even when that's not the case, as some games do indeed have a linear flow which more resembles a movie, you're still going to have to account for gameplay," says Gaider.

"That has a serious effect on the story's pacing. Imagine if, during the middle of *Star Wars*, you had to sit through a half-hour sequence as Luke Skywalker explored the Death Star and engaged in random battles with stormtroopers.

"The interactive nature of a game changes how the story is laid out, and thus the tools a writer has at their disposal. Thus the skills that are needed to create that story are very different."

Storm in a Teacup co-founder Alberto Belli, whose studio is working on *Nero*, says the major challenge facing writers is to make the narrative fit the environment and the emotions characters should transmit.

"The reward system is straightforward but when you have to build a game around the narration and not vice versa, you pretty much understand soon why usually the story is a bonus in games nowadays," he says. "In a game like *Nero* the biggest challenge is for sure to tie together environment and storytelling."

STRUCTURING NARRATIVE

Meg Jayanth, writer of Inkle's mobile title *80 Days*, says the wide spectrum of genres the medium covers means the challenges of constructing narratives for its title and the likes of *Call of Duty* or *Civilization* can make it difficult to craft stories for different types of game, particularly when the technologies, structures and formats continue to evolve.

"Telling good stories is hard work, it's a craft, and like any craft it has to be practiced and honed," she says. "It's hard to get really good at telling stories when the way you tell

Top to bottom: InXile's Brian Fargo and Inkle's Jon Ingold

them is constantly shifting underneath you – not impossible, just hard."

Given the vast array of genres and techniques, is there a best method for telling story in games? Or does it simply just depend on the game and its duration?

Inkle creative director Jon Ingold says while it depends on the game, the most interesting form if storytelling is a "highly adaptable but largely linear story model". He describes it as similar to what BioWare has done in the past and what his team is trying to do at Inkle.

"So the broad arc of the story is reasonably constant, but the moment-to-moment experience of the player is extremely flexible, and that flexibility shapes how the larger story plays out," he says.

He describes the experience of *80 Days*, where the story is built into acts that cover distinct themes, but individual stories players encounter can be vastly different.

"No two routes are the same; we have an enormous pool of events and characters to draw on," he explains. "But whatever you do, it'll fit together to form the right sort of narrative arc.

"Episodic structure can be useful for containing branchiness and stopping it from escalating, but it's largely just a business model, I think."

Failbetter Games CEO Alexis Kennedy says however that there is no best method that exists for telling narrative in games.

"There is a worst method, which is to ignore the idioms and affordances of the medium and take too many cues from films or short stories," he says.

"But I feel like that was the big lesson of the noughties, and now we're reminding ourselves that three thousand years of narrative history has given us techniques that we don't want to throw away. The cliché is that gaming's looking for its *Citizen Kane*, but Welles started out in theatre, not film: he brought the lessons of old media across."

BRANCHING OUT

Triple-A games in particular are increasingly offering expansive worlds that let the player interact with the main narrative at their own pace as they take on numerous side quests, all the while generating their own stories that feel unique to them.

Allowing the player to essentially create their own stories brings up a big headache however, and that's predicting how they might go through the game, and how many branches you can allow for.

InXile Entertainment recently took the interesting tack of closing off hours of content to players in *Wasteland 2* based on their decisions, even turning some side adventures into the main finale. In fact, a fully scripted character right at the start of the game can either join the player's crew or be left behind.

"Every possible branch needs to be written and fully realised, even if not every player sees it, and thus any game which allows for a lot of player choice becomes a much more expensive proposition for a developer," states Gaider.

"A story which takes someone ten hours to play through could contain 30 hours worth of content, or more, depending on how many branches it contains and follows through on. Thus it's not a question of encouraging developers to let players make choices in their stories, but whether they're willing to pay for it. Not every developer is, and not every type of game is going to benefit from it."

One of the issues that emerges in many modern games is the ability to save and simply reload the game. For example, though the *Mass Effect* trilogy offers many important decisions, most notably in the *Mass Effect 2* ending scenes, it's often tempting for players to self-sabotage their experience by restarting from a checkpoint, taking away tension and lowering the stakes.

Inxile's Brian Fargo says back in the days of *The Bard's Tale*, players could only save the game in one area, bringing with it a sense of risk to players' actions. One of the solutions to the persistent ability to save, he says, is to present consequences to decisions much later in the game.

He explains: "I think about the reason why movies are more emotionally pulling

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JET VIEW
MOTEL

Above: 80 Days writer Meg Jayanth

Right: Failbetter Games' Sunless and InXile's Wasteland 2 (top)

you into them. Because even though you know it's a film, once a character does something, and he dies, there's no undo button. The director is not going to go 'just kidding'. That character is dead. Period. And so you're emotionally attached to it.

"In a game, because you can just hit load instantly, you lose the emotional moments. That's why there has to be that time in-between, otherwise you'll never get that."

A CHANGING MEDIUM

While storytelling in games is evolving down new avenues, it could be argued that narrative is evolving at a much faster rate than the medium itself, which often relies on shooting and killing, as seen in the top triple-A games, and adapting a reason for doing so.

Kennedy says the general problem developers face is that game mechanics are about the same events happening in different ways, while stories are about different events happening.

"Game stories that are closely tied to mechanics tend to be one-note or minimalist, unless the mechanics are big and sprawling," he says.

"That's not always bad – a tightly scoped minimalist story can be very effective – but creators often want to push out into more varied directions. One of the reasons we love using text in *Fallen London* and *Sunless Sea* is that you can do varied things – and non-combat things. But of course text has its own limitations.

"I think this is an evolutionary thing. Between developers and players, we already have a powerful and flexible set of shared idioms – I think we'll be able, as the idioms develop further, to use them to sketch or to signal a greater variety of story."

Ingold agrees, and says that players' appetite for stories in games is also evolving.

"I think a lot of games are butting up against the limits of standard mechanics," he states. "The current models are a bit of a hack, really; they've evolved out of shoving a screen of text before each level in *Operation Wolf*. But right now games are evolving and that's great to see."

Despite the difficulties of unshackling games from some classic mechanics engrained in the biggest triple-A titles, the role of storytelling in games is still becoming increasingly important, and we'll continue to see change over the next few years as the medium develops further.

As Gaider says: "I think you'll see more developers taking risks, or at the very least realise some commonly-held industry beliefs aren't as valid as they once were – as gaming permeates popular culture and becomes a more accepted medium, I think it's just naturally going to mature, if not always gracefully."

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Eco friendly funding

Adapt, a new fund available to studios and start-ups in the East of England, is offering up to £1m to low-carbon businesses. **James Batchelor** finds out more

Adapt project officer Sam Burton says it's looking for games businesses due to the sector's strong history and the growing need for support at start-ups

THERE ARE MANY sources of investment and funding available to developers, but one new scheme is as much about helping the environment as it is about businesses.

Adapt's Low Carbon Innovation Fund, run out of the University of East Anglia, is designed to promote clean business practices and help firms that use them grow.

Available to small-to-medium-sized enterprises within the East of England – that's Norfolk, Suffolk, Cambridgeshire, Hertfordshire, Bedfordshire and Essex – the Fund has now turned its attention to the games industry.

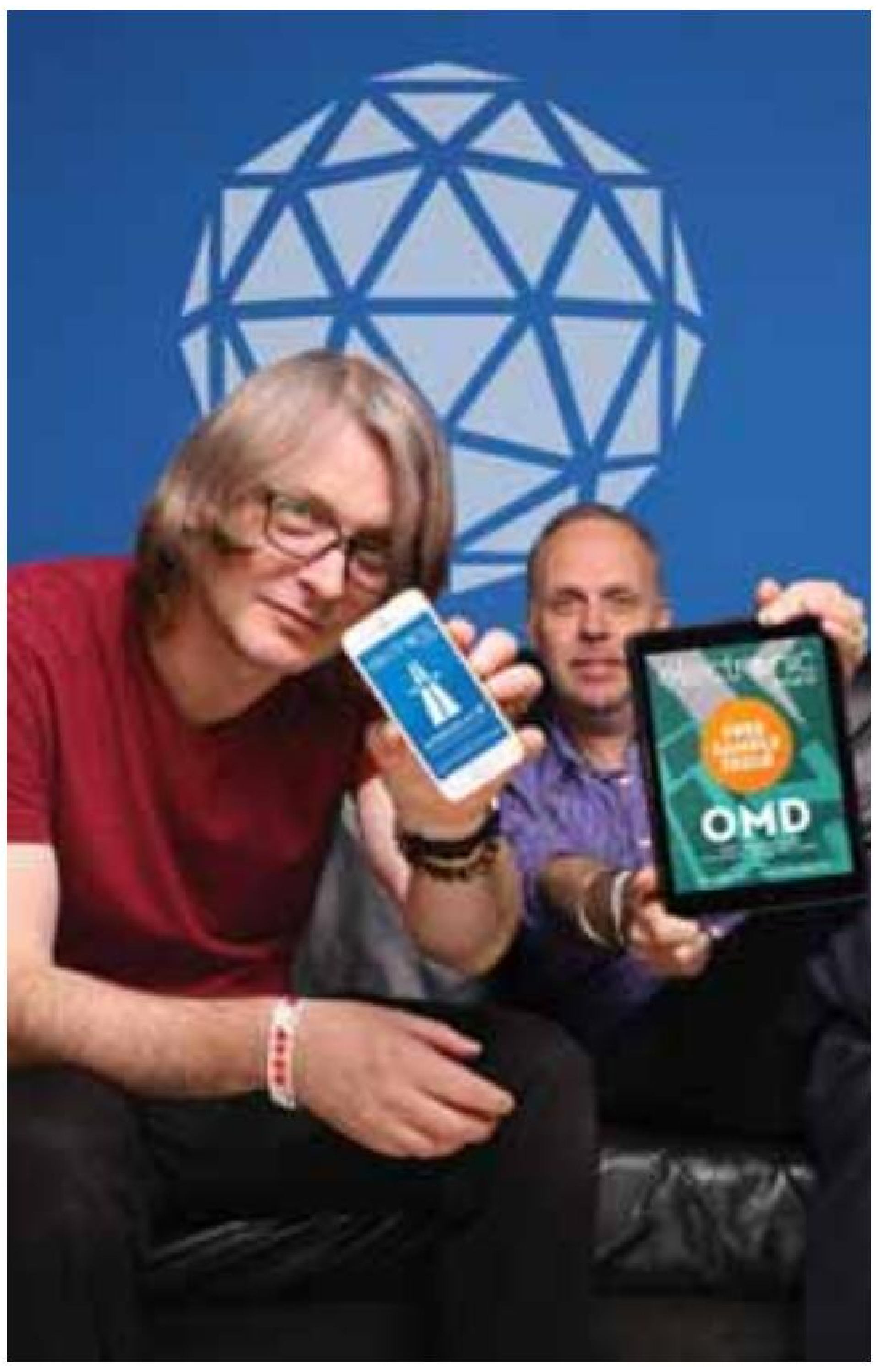
"We are particularly interested in games. software start-ups and established businesses because gaming has a strong background in the UK that needs to be supported," says project officer Sam Burton.

"With the industry opening up for independent publishers and developers there are opportunities for smaller companies to come to the fore. We believe there are many talented gaming companies who would be suitable for the Fund and we would be delighted to hear from them."

ENVIRONMENTALLY-FRIENDLY STUDIOS

The Fund offers a wide range of investments – from £10,000 up to £1m – to studios of all sizes, be they start-ups or established developers. These investments are also designed to help businesses expand or update their equipment and processes, particularly if it brings the company into line with the fund's low carbon ethos.

"Companies applying need to have a commitment to the low carbon ethos of the Fund," Burton says. "This could mean operational changes to the way a business is run, paperless offices, conducting meetings via Skype, thinking about power usage or other ways to improve resource and energy efficiency. It could also include carbon-reducing impacts through gaming content.



"The business must also be able to secure co-investment from the private sector to match the amount requested from the Fund. This means that we need a pound-for-pound match with private co-investment. This could be from another VC fund like ours, high net worth individuals, founders' own investment or from friends and family.

"The application process involves a web enquiry form, followed by conversations about the business plan with a member of our team. We go through a process of due diligence with all companies that apply, which includes looking at the management team, business plans and financial information."

So why dedicate an entire funding initiative to the low carbon cause? Burton says it's important for everyone to think about their impact on the environment.

"Often small changes in business operations can add up to make big carbon savings, and in many cases this will translate to financial savings too, so it can only be a positive change," she says. "The LCIF is able to assist firms in looking at their operations.

"Small changes can all add up to significant carbon savings. Looking at the energy that is used, be it in terms of server/data resources to being vigilant and turning off equipment and lights when they are not being used, to doing something as simple as putting in low energy light bulbs. Thinking about whether meetings can be conducted using Skype or FaceTime rather than making unnecessary journeys – all of these small and easy changes do have an impact."

START-UP SUPPORT

Adapt's smaller investments scheme, which offers between £10,000 and £75,000 to games studios, provides a business mentor that can advise not only on how to implement low carbon practices but also broader business plans and help in the search for potential co-investors.

"Access to finance in the current climate can be difficult for any company, particularly those working in the creative industries," she says. "Start-ups and smaller businesses typically find it more difficult to raise finance than more established businesses since traditional sources of support such as banks require proof of consistent revenues and securable assets.

"The LCIF can offer businesses investment that will enable them to grow and develop."

The variety of companies Adapt's LCIF has invested in include a banjo manufacturer, an opera and digital music magazine Electronic Sound (*pictured*). It is now actively searching for games companies to join this roster.

To find out more about the fund and how to apply, visit **www.lowcarbonfund.co.uk**.

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For over five years, Codemasters Birmingham has been home to the BAFTA Award-winning series of FORMULA ONE games and now hosts the talents of two teams: one crafting new FORMULA ONE experiences for consoles and the other creating mobile games. Whichever team you choose, you'll find colleagues who pride themselves on doing great things in a supportive and innovative environment. Codemasters Birmingham offers a friendly working culture in an open-plan, fully refurbished 6th floor office overlooking the city's entertainment district.

CODEMASTERS KUALA LUMPUR

In 2006 Codemasters Games Studio (UK) opened its first overseas studio in the heart of Kuala Lumpur, Malaysia. Ever since, Codemasters Studios Malaysia has contributed artwork to almost every title developed by Codemasters, including the BAFTA-winning titles such as Grid and F1. Today Codemasters' studio in Malaysia houses 50 staff focusing on art production for our upcoming titles. The KL studio is running a unique set of training programmes which allows aspiring artists to train alongside our world class production teams. Codemasters in KL, via its games production contributions and its training programmes, has made a tremendous impact on the local industry; the presence of a world-class games art facility has influenced local games production standards.
Right now Codemasters Malaysia is setting up a Mobile Games Development Team in the KL studio. This team is due to start games production on its first titles later this year.

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Your monthly guide to the best career opportunities in games development worldwide

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Tim Christian named chairman of Dimensional Imaging
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CLIMAX
STUDIOS

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Climax's Stuart Godfrey on what it wants from prospective staff
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A look at the games courses at the University of Bradford
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How modding can land you a career in games

With more and more people vying for jobs in games development at the moment, you really need to make yourself stand out. But there is a way to easily gain experience while making you attractive to prospective employers

by Alex Calvin

THERE ARE A number of ways to break into the games development scene at the moment.

You can pursue an education, going to university or applying for internships at studios. Or you can, of course, just relentlessly send your CV and portfolio to developers in the hope they will give you a job.

But one often overlooked way of making your way into the industry is through the modding scene or through the creative communities on the likes of *LittleBigPlanet*.

In fact Boss Key founder and former Epic Games developer Cliff Bleszinski has been hiring people straight out of the modding scene.

"One of the people we are thinking about hiring right now is a level designer who has no professional experience in the industry outside of making fantastic *Team Fortress 2* maps," he says.

"Those levels were actually picked up by Valve. Because he had the gumption to make a good-looking website and highlighted that they were bought by Valve rather than submitting a resumé, we sorted the wheat from the chaff and found him."

Sheffield-based Sumo Digital, the developer behind *LittleBigPlanet 3*, went so far as to hire entire sections of its development team for the title from the community that formed around the creative platformer series.

> ***"Sumo's level design team was all hired from the LittleBigPlanet community."***
>
> Damian Hosen, Sumo

"The level design team is made up of 15 or so people, all hired from the *LittleBigPlanet* community," Sumo's design director Damian Hosen says.

"One of the things that [Media Molecule co-founder and creative director] Mark Healey said to me was one of the things he's most proud of with *LittleBigPlanet* was that loads of people have gotten into the games industry who wouldn't have otherwise. Those people have been a really powerful creative force on this game. It's been great bringing new people who are really talented."

And of course, the mods you create can just have legs of their own. The critically acclaimed *Dear Esther* by Brighton-based studio The Chinese Room started out life as a free *Half-Life 2* mod in 2008. And once that version of the game saw success, the team went back and made a 'proper' commercial version of the title.

"The indie explosion pushed mods back to being a bit niche," he says.

"There are still a lot of games like *Minecraft*, where the modding community is still incredibly vibrant. Modding is a fantastic way to get really innovative things, to gain experience, to create without expectations. There are more expectations now that getting a game to market is a huge effort.

He concludes: " I spoke to [former creative director] Matt Hooper at id Software a few years ago who said there was a generation of first person shooters developers who came from modding. There was a period where everyone was a *Doom* or *Quake* modder. You could get as much attention from making mods." ■

MOVERS AND SHAKERS

This month: Dimensional Imaging, Bigpoint, Playground Games and Playfab

GAMES VET JOINS DIMENSIONAL IMAGING

DIMENSIONAL IMAGING ■ Games industry veteran **TIM CHRISTIAN** has been appointed as the new chairman of the Glasgow-based performance capture company.

Christian's career in the games industry spans almost 25 years, and during this time he has run Microprose and Hasbro Interactive. He is also the chairman of Scottish analytics firm DeltaDNA.

"I am delighted to have been appointed as Dimensional Imaging's new Chairman," Christian said.

"With the recent launch of their head mounted camera system ('DI4D HMC'), and on-location facial performance capture service, the company has huge potential in the games, TV and movie industries. The demand for high definition full performance capture solutions is increasing, and I'm very much looking forward to seeing the potential of DI, and its excellent products, realised."

Colin Urquhart, Dimensional Imaging's CEO, added: "I am very pleased to welcome Tim as the new chairman of the company and delighted to be working alongside someone of his calibre. Having been involved in the games industry at the highest level for over 20 years, Tim will play a vital role in ensuring we capitalise on every market opportunity. Dimensional Imaging is renowned for providing high fidelity facial data for triple-A video games, and with Tim's experience and invaluable industry knowledge, the company's reputation will be second to none."

BIGPOINT ■ The online developer and publisher has announced two new additions to its advisory board.

Co-founder of Mythic Entertainment and former COO of BioWare **ROBERT DENTON** and **JAYSON CHI**, leader of gaming practice at McKInsey and Company, will be offering their expertise to the company.

"Our main focus at Bigpoint is to maximise the fun in our games, increase the accessibility of our titles, and maintain fairness in our environment", says Bigpoint CEO Khaled Helioui. "From a strategic standpoint today, this translates to an ever increasing focus on content quality and an aggressive expansion to Asia.

"Rob brings a wealth of development experience and a rare passion for games that will be of great support to our development teams. Jayson has been covering the Asian gaming space for over ten years and is going to play an instrumental role in assisting us in our expansion strategy. Having them join the Bigpoint family is a testament to the work of the teams over the last two years."

PLAYGROUND GAMES ■ Talent acquisition veteran **ALEX WRIGHT-MANNING** has moved to *Forza Horizon 2* developer PlayGround Games.

He joins having worked for two years at Horsham-based studio Creative Assembly. Prior to that he was senior talent acquisition consultant for recruitment firm Datascope.

He will be over seeing the studio's recruitment and retention strategy.

"I'm absolutely delighted to have joined such a forward thinking and exciting studio at a point where it is rapidly expanding, and I look forward to contributing to the growth of an already highly successful team," he said.

PLAYFAB ■ Game operations firm PlayFab has appointed **CHRIS DONAHUE** as director of developer relations.

In this role, Donahue will be tasked with growing the company's customer base.

Prior to joining PlayFab, Donahue founded business development, marketing and PR firm Elevate Partners. He has also served as VP of marketing and publisher relations at CiiNow, as well as director of publisher relations at game streaming firm OnLive between 2010 and 2012.

Donahue has also held roles at developer InXile, marketing firm Elevate Partners and Microsoft.

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RECRUITER **HOT** SEAT

Climax Studios recruitment manager Stuart Godfrey on what the developer can offer prospective employees

BIO
Name: Stuart Godfrey
Title: Recruitment manager
Developer: Climax Studios
Country: United Kingdom
www.climaxstudios.com

> ***"Take your CV back to basics, make it succinct, concise and simple."***
> Stuart Godfrey, Climax Studios

What differentiates Climax from other developers?
We are a truly independent development studio based on the South Coast that has a great handle on leading edge gaming technology across a multitude of gaming platforms and technical disciplines.

We actively encourage our staff to have a voice and to pro-actively contribute their ideas. From the most junior of our team members to our most senior artists, if they have something to say of value then they are listened to. It's key to us that they have a real sense of ownership of what it is that they are looking to achieve. Every member of staff is a valued key component at Climax Studios – where everyone is encouraged to highlight their ideas and suggestions.

How many staff are you looking to take on?
It is difficult to give an exact number at any given stage, but we are currently looking to attract experienced programmers, level designers and a talented lead designer. For example, last week alone we employed 13 new members of staff.

We have a number of truly exceptional opportunities currently available in the coding team for experienced and senior programmers especially in the engine and graphics departments. Another excellent opportunity that has just opened up, is for a UI/UX Artist with an exceptional eye for detail and excellent 2D artistic ability with a strong technical slant. A look at our website will give you a full picture of the talent and skillsets we are looking to take on, with all the details of the relevant job descriptions.

What perks are available to devs working at your studio?
Again, as Climax Studios is a truly independent studio we have numerous projects running concurrently; the positive side to this is that we do work across numerous platforms and with any technology.

We already have many key members of staff that are top in their respective fields. Those successful candidates we do recruit will subsequently be able to learn from and be trained by some of the industry's best. As an employee at Climax Studios you will be able to get involved in all kinds of projects on many platforms and in many genres. Our recent VR work is a perfect example of this.

In terms of employment, the packages we have on offer include highly competitive salaries and an extensive range of benefits that include private health care cover, a pension scheme, an excellent holiday package, flexi-time, subsidised gym memberships, Gunwharf Quays discount shopping card and the ever popular Beer Fridays.

This all comes with the added bonus of our stunning harbour-side location with sweeping sea views across the Solent.

What should aspiring devs do with their CV to get an interview?
Take your CV back to basics, make it succinct, concise and simple, clearly listing 'all' your skill sets and give a clear idea of what drives you on a daily basis. We would actively encourage any applicants to apply direct to Climax Studios as these CV's will always get priority treatment and attention.

We feel this shows us that the applicant has a strong interest in working for us and that they are targeting the role they wish to secure.

Once the applicant has submitted their CV, it's always a good idea to follow this up with an email or a telephone call to ensure that the application has landed safely and is in the correct hands. Climax is a busy place so go that extra mile to give your application that all important extra edge. And finally, where possible, make sure your passion for games flows through your CV.

Who is the best interviewee you have ever had and how did they impress you?
It is still without doubt a young character artist we met at a university showcase. Her passion and drive to get into the industry really left a mark on me. We kept in touch all through her studies and when she returned to her home country. When we had a position open up, I got back in touch, we interviewed her and shortly after she was offered the job. She went on to become a lead artist.

What advice would you give for a successful interview at your studio?
Research. Find out what we are all about. You are looking to come and work with us so you should find out as much about the company and its pedigree as possible. Learn, in advance, direct from ourselves as much as you can about the role you are interviewing for.

Be prepared and make sure you get across to the company what you want to and try and be as confident and as passionate as you can. If you are an artist or an animator bring in your reel, portfolio and sketchbook. Designers should come prepared with examples of their work, and coders should bring along any demos or code samples.

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GET THAT JOB

Development specialists offer advice on how you can bag that career leap

THIS MONTH: GAME BALANCER

GOODGAME'S ALEX FELTON on what it takes to be a game balancer:

What is your job role?
I work as a game balancer at Goodgame Studios, a leading free-to-play games developer and publisher based in Hamburg, Germany. Game balancing is a specialised part of game design, focusing on the systems and mechanics within a game that a player may not be aware of but interacts with continuously. I work closely with both game designers and product management to create new features and systems. My main tasks are to design the difficulty, progression, rewards and monetisation of a feature.

How would someone obtain your role?
A strong interest in game mechanics and systems is key to becoming a good game balancer. On top of that, it helps to be curious about deconstructing the rules and systems of all types of games, not only digital ones.

> ***"Paper prototyping and board games are cheap ways to test concepts."***
>
> Alex Felton

This will allow you to understand the benefits of the mechanics and how they fit together to form the play space. Building on that, you will be able to design your own mechanics and anticipate how they will come together in your own games.

A large portion of balancing also revolves around maths, so it is critical that you are comfortable working with numbers in this role.

What qualifications and/or experience do you need?
There is no set path to become a game balancer. At Goodgame Studios, all our balancers come from different backgrounds such as mathematics, physics, psychology, programming along with game design, which is what I personally studied. Generally speaking, you should be familiar with the games development process. A good way to gain this familiarity is to create your own game concepts, ideally pursuing them to a testable state. Paper prototyping and creating board games are cheap and fast ways to test concepts, without requiring any coding knowledge. A key asset to fulfilling this role is to have a good understanding of player behaviour. Having this knowledge can aid you to design challenges and rewards that cater to a variety of player types, ensuring the game is an enjoyable and rewarding experience for everyone.

When interviewing someone to join the team what do you look for?
For game balancing positions in particular, Goodgame Studios is looking for people who have the right mindset. During the interview, we want to see how they approach a problem and for them to display creative and logical thinking to reach a solution.

If you've got job advice to share, email **acalvin@nbmedia.com**

Diaries from **ALACRITY FALMOUTH**

Innovations in Incubation

London's calling

Nathan Egner, a programmer and game designer at Alacrity Falmouth, reflects on his experience with the academic incubation intiative

ONLY A FEW days after completing my BSc Computer Games, I found myself packing and moving to Cornwall to embark on a new exciting opportunity: the Alacrity digital games incubation programme at Falmouth University.

On arrival I was introduced to the team I was to spend the year working with. I was really inspired by Alacrity's industry links and I immediately engaged with the projects, keen to get to work. Amongst a variety of team building and coaching exercises in the initial weeks, all 20 Alacrity students took part in an intense two-day game jam around the chosen topic of "Shadow". We quickly got to work creating what we felt was a unique take on an old arcade style formula of cat and mouse gameplay, using the exciting new UE4.

Once the jam was over we were left feeling very proud and decided to submit our game to an Unreal Engine competition to compete against games from all over the world for a space on the Epic Games booth at EGX. We returned our focus to our main Alacrity project, the competition was put to the back of our minds until we were contacted by Epic Games and asked if we could attend.

> ***"Having people play and enjoy our game felt incredibly rewarding."***

With EGX just around the corner and feeling very excited we proceeded to polish the game, improving everything from basic controls to graphics and level design to ensure the public could enjoy what we only ever envisioned the Alacrity Falmouth Studio would see.

Arriving at Earls Court at the end of September, we couldn't help but smile thinking about what we had achieved in the last four months. We found ourselves star struck, rubbing shoulders with people we look up to and meeting like-minded thinkers and developers. The event had an inspiring atmosphere with developers from all over the world excited to show off their newest projects. Having people play and enjoy our game felt incredibly rewarding.

SKILLS AND TRAINING

This month: University of Bradford

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E: course-enquiries@bradford.ac.uk
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THE UNIVERSITY OF Bradford offers a selection of undergraduate programmes focused on games development for aspiring professionals.

Its Computer Science for Games BSc (Hons) programme focuses on the programming skills required for building games and apps, while its Graphics for Games BA (Hons) course concentrates on the production of visual assets and artwork for use within games. The Interactive Systems and Video Game Design (BSc) Hons programme meanwhile offers a range of modules including level design and 3D modelling, and also allows students to specialise in areas such as motion capture.

Senior lecturer Carlton Reeve (*pictured bottom right*) says its programmes, which he claims are among the most established game development courses in the UK, introduce students to the history and conventions of games, audience expectations, the requirements of player-centred design and the need to work in an interdisciplinary team.

University of Bradford senior lecturer Carlton Reeve says its games development courses are amongst the most established in the UK

"They benefit from the university's expertise in media production and theory and the unique relationship with the National Media Museum," says Reeve.

"The courses offer a unique combination of art, science, technology and application to ensure that graduates have a rounded perspective on game development. Each of the programmes also includes the option of a year-long industrial placement."

Reeve goes on to says that the School of Media, Design and Technology, that delivers the programmes, is active in games related research, including in visual computing and motion capture. Next year, the educational institution also has plans to launch a new international conference on game-based learning.

The university has strong links with Yorkshire business network Game Republic, which represents local studios such as Rockstar Leeds, Sumo Digital and Four Door Lemon, and is also an academic partner of the BBC.

Reeve says the university capitalises on these links within the industry by giving all students the opportunity to take a year's work placement with a relevant games or media firm.

"In addition, the School of Media, Design and Technology hosts the Digital Media Working Academy, a unique academic, commercial bridge that brings real-world projects in from businesses and other organisations and provides professional oversight and mentoring for students production teams," he says.

When studying, pupils also have access to a range of special software such as Autodesk software, Mudbox, UDK and Adobe Creative Suite products. It also houses its own motion capture suite that plays an integral part of its animation and modelling modules.

Reeve claims that these links, available tools and heritage has resulted in 80 per cent of the university's alums going on to find relevant work or further study within six months of graduating.

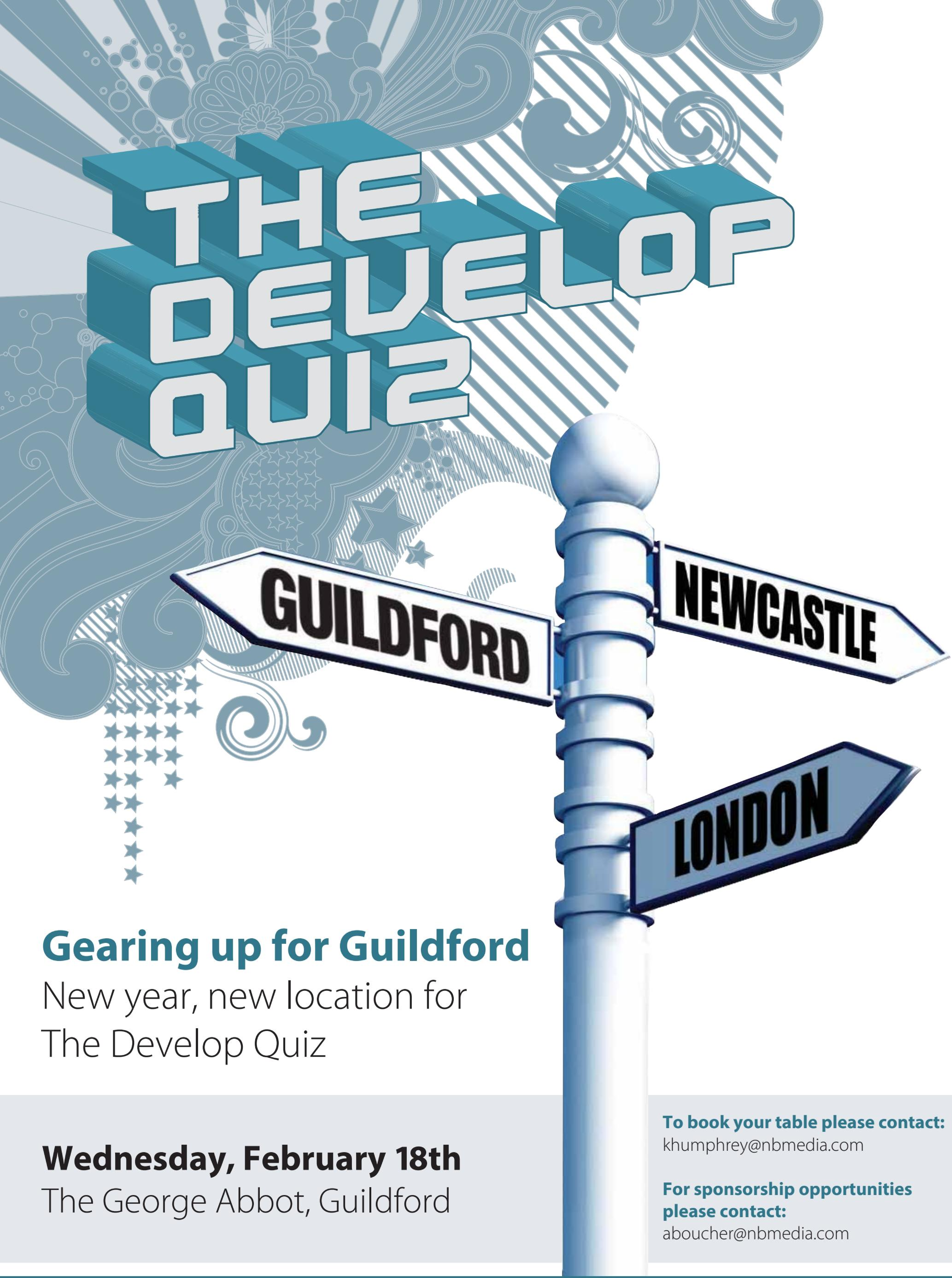
In 2015, the University of Bradford (pictured above) plans to launch a new conference focused on game-based learning

INFO

Courses: Computer Science for Games BSc (Hons), Graphics for Games BA (Hons), Interactive Systems and Video Game Design BSc (Hons)

Country: UK

Staff: Kaye Elling (Head of Department), Karl Abson (Lecturer), Carlton Reeve (Senior Lecturer), Jason Theaker (Lecturer) Prof. Hassan Ugail (Head of Research), Dr Tao Wan (Senior Lecturer)



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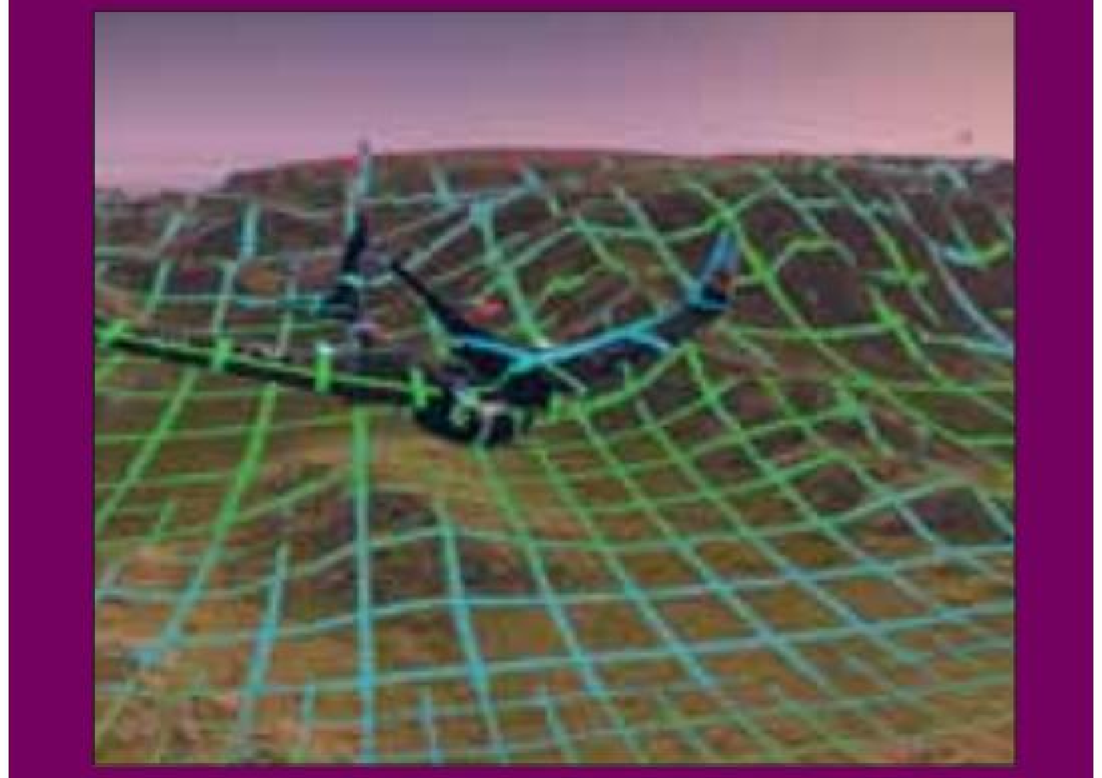

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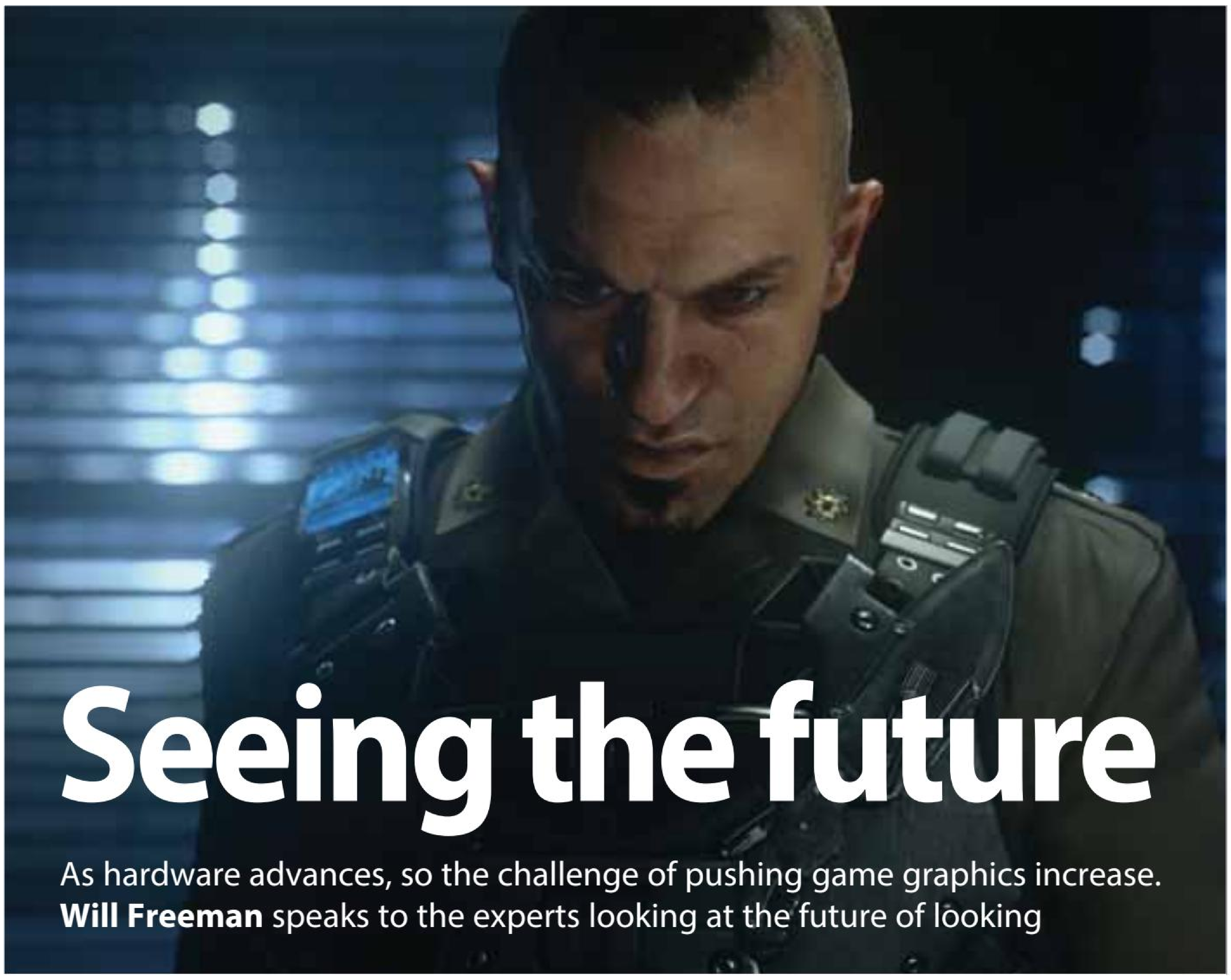


Seeing the future

As hardware advances, so the challenge of pushing game graphics increase. **Will Freeman** speaks to the experts looking at the future of looking

A LITTLE OVER 30 years ago AMD was rightly proud to unveil a graphics chipset boasting a 2KB memory capacity.

This summer, the longstanding semiconductor specialist debuted a graphics card with 2GB of memory. Even without considering more top-of-the-line products, that's a million-fold increase over 30 years. Or a decade-by-decade exponential growth rate of a hundred-fold. And it doesn't even touch on advances in compute density.

Growth numbers like that are certainly impressive, and as such it's easy to get exceedingly optimistic about technology's accelerating potential. But in spite all of that, game graphics' stride into the future has, in recent years, seemed to the layperson to have slowed down. Photorealism still lies just out of reach, and the bold leaps forward of the past – such as the move to 3D – have become tiptoed steps through the same region that is home to the uncanny valley.

There's reason to be optimistic, certainly. The consumer appears to have an insatiable appetite for ever more advanced displays, hardware outfits continue to push horsepower, and Moore's infamous law still just about holds true.

As such, it's easy to hear a lot of long-promised technologies making a lot of noise again. Stereoscopic 3D as standard continues to enjoy a push, it's a definite maybe that VR is here to stay, we've our fingertips over the cliff edge of the other side of that uncanny valley, and photorealism is rumoured to be close now. Really, close, in fact.

SAGE WORDS

One person who knows what it is to chase the dawn of photorealism is Richard Huddy. He is AMD's chief gaming scientist, and a veteran of the semiconductor and GPU business.

"I started in all this in about 1996 with 3Dlabs, so getting close to 20 years ago now," offers Huddy.

> ***"It's awfully difficult to build stable, high quality shadows; there's just no terribly good algorithm for that."***
>
> Richard Huddy, AMD

"For most of that time, I would say to developers photorealism was 'about ten years away, or something like that', and then I started to know that was a little optimistic. It seemed for a time like we might even make it by 2006 or 2007, but we clearly didn't."

So when does Huddy feel studios will be able to deliver game worlds that are utterly convincing, and indistinguishable from reality?

"We'll have limited photorealism in five years from now," says Huddy. By 'limited' he means that stills, or short pre-rendered

Geomerics director Chris Doran (above) believes the games industry can learn a lot from the film industry when it comes to standardising complex material pipelines

Top to bottom: Havok principal software engineer Dag Frommhold and Realtime UK director Dave Cullinane

Main: The latest Call of Duty: Advanced Warfare takes a step closer to photorealism by copying the likeness of lead actor Kevin Spacey

scenes, might trick even the most careful observers for a short time.

The reason for Huddy's caution is simple. There remain a number of barriers to making game graphics emit every detail of real life.

One example is screen size. According to Huddy's research, a screen 8k-by-6k would just about offer enough pixels to match 'eye resolution'. 48 million pixels, in other words. That may not be too far off, but photorealism is about much more than the games development canvas, and there are far more intricate problems to best.

SHADOW IS THE BEAST

"The amount of processing time that is spent on very high quality shadows these days can, surprisingly, be quite a bit more than the amount of processing time spent on the rest of the scene," continues Huddy. "That doesn't feel terribly likely, but it's awfully difficult to build stable, high quality shadows; there's just no terribly good algorithm for that, and it's a current barrier to photorealism."

If developers were able to do ray tracing with a sufficiently high number of rays in a fully dynamic scene – Huddy feels around a billion per frame ought to do it – they might be able to generate a good quality image that might include photorealistic shadows. Alas, as it would take far too much compute power away for most, for now it remains something developers and hardware outfits must revisit in the future.

However, there have been significant, near-tangible leaps forward in the graphics space today where light and shadow are concerned, especially where physically-based shading is concerned.

"The biggest trend of the last few years has been the adoption of physically-based shading techniques," asserts Chris Doran, director of the prolific Geomerics, which specialises in lighting technology.

> **"*We are still pretty far away from photorealism, and there is a lot of R&D effort needed to get closer.*"**
>
> Dag Frommhold, Havok

"The rate of adoption has been quite stunning – it is unusual for the industry to move en masse in one particular direction. Part of this was maybe due to the console transition. Everyone was looking to improve their graphics pipeline, and physically-based shading was the right technology at the right time.

"For our team, the interest is about how much room for standardisation there is in material models based around the techniques of PBS.

"I think we can learn from the film industry here from the way they have standardised their very complex material pipelines."

MESHING TOGETHER

It isn't just about shadows and rays either. It's also to do with the human capacity to match technology's advance.

"The challenge that developers face will be in getting the right skill sets in place within their teams," says Dave Cullinane, account director at CG specialist RealtimeUK, on the photorealism problem. "Putting together teams that have both expertise and experience in creating the level of visuals that we are able to achieve is no easy task."

Cullinane points out that while the tools and technology are getting better and more accessible, they are meaningless without real experience and creativity.

"Results at the level that our own clients demand are very rarely achieved by talented individuals acting alone; modelling, lighting, rigging, animation, shader development are all highly specialist skills. The best results are created by those teams sitting under one roof who have a history in working closely with one another and solving problems together."

Away from the challenge for very real development talent, there's also a potential obstacle to reaching photorealism at the very core of modern 3D games development. It may just be that the polygonal model itself isn't the smoothest path to convincing, lifelike graphics.

"Polygons have been bent into shape by the evolution of graphics hardware, really quite severely, over the last 15 years or more," states Huddy. "And they've stood up really impressively well. One of the best things that we ever did was to add tessellation to our hardware. The original Xbox 360 had tessellation hardware and it was introduced by Microsoft into DirectX11. That has helped as a form of geometry compression, but

Top left: Geomerics' lighting tool Englihten in action

geometry compression is there because of the fact that memory has not been ramping up as fast as compute over the years."

Suggesting developers will need a memory bandwidth 'near-infinite' to make that a reality, Huddy believes we are a couple of generations away from escaping the current confines.

BEYOND REALITY

It's important, though, to remember photorealism is not the be-all-and-end-all for games graphics; something most contributors to this article were keen to highlight. However, overcoming the challenges in pushing photorealism should help developers making games less tethered to reality.

"There is still a lot of room to improve graphics – stylised or photorealistic – further," confirms Dag Frommhold, principal software engineer at middleware powerhouse Havok. "In fact, we are still pretty far away from photorealism, and there is a lot of research and development effort needed to get much closer. For features such as global illumination, reflections, and even shadows, all current real-time graphics engines use more or less elaborate hacks which are relatively plausible, but still a good bit away from the ground truth.

"As everybody knows that the last ten per cent of quality takes between 50 per cent and 90 per cent of the development time – depending on who you ask – we can extrapolate how long it is going to take."

So how long is it before we can let designers run free of restrictions, and produce game worlds that are not just photo-real, but 'imagination-real'? Huddy puts it at a decade after true photorealism; itself a time nobody can quite settle on.

People are working together on the problems if not the schedule, though, and must continue to do so if the games industry is to break the back of photorealism, and strive beyond that to some of the more out-there graphical concepts (*see panel 'Game Graphics Unbridled'*).

But there is a need for collaboration across that other valley that exists in game design; the void between art and technology.

Peter Busch is vice president of business development at facial motion capture experts Faceware, which contributed to the striking quality of *Call of Duty: Advanced Warfare* cinematics. And he is certain an olive branch connecting programmers and designers can do much to help move game graphics towards photorealism.

"There is still a gap between the art and programming side," says Busch. "For example, it is still common late in the development cycle for the quality of graphics to suffer simply because late development challenges force that concession. One of the main areas to suffer is animation. Many times character animation is created at a higher quality, but is 'clamped' down due to programming and engine challenges come ship time."

Frommhold adds: "As a substantial bit of the technological advances are driven by new or upcoming hardware, I think it is critical for hardware and software developers to work closely together in order to ensure the best possible end-user experience.

"This is especially true for new experiences such as VR which are – despite all the well-deserved enthusiasm around them – essentially still at a very early stage and need to prove themselves."

However, press your ear against the industry rails, and it's easy to eventually hear mild caution around over-optimism towards collaboration. All agree it's important, but some sense working together needs to be addressed with care.

"You have to be careful with words like standardisation in the games industry, as there is a suspicion that standards stifle creativity," proposes Geomeric's Doran. "But if the standards are right, people get behind them and that makes everyone's life easier. It isn't totally clear yet that the material model used for today's physically-based implementations is flexible enough for most games, but the signs are pretty good.

"And one of the biggest benefits of the games industry adopting a common framework is it gives the hardware guys a fixed target to aim at. That could really push things forward."

The ultimate forward, of course, is the Holodeck; a concept made iconic by *Star Trek*. The Holodeck sees a player move through a completely interactive, realistic and tangible virtual world pulled from their own mind, without the need for any carried or wearable hardware.

TO BOLDLY GO

It's not likely middleware and engine companies will be releasing Holodeck SDKs anytime soon, but the advances being made are significant, despite all the challenges. And according to Huddy, The USS Enterprise NCC-1701-D's own spin on the arcade might not remain a flight of fantasy indefinitely.

"We've talked inside AMD and ATI about gravitating towards the Holodeck experience, creating an immersive situation where everything around you is properly represented and you are totally within that," confirms Huddy.

"I think that makes more sense in the very long-term than the VR goggles approach, which will always weigh something and slow you down. You can't scratch your face with VR goggles on.

"There is no doubt we will end up there," concludes Ruddy of the Holodeck.

For now, though, studios may have to put up with the challenges to photorealism and the difficulties of VR, and return to the Holodeck another day.

Top to bottom: Faceware VP of business development Peter Busch and AMD chief gaming scientist Richard Huddy

PHOTOREALISM IN VR

A look at the numbers behind putting the reality into virtual reality

ONCE ACHIEVED, PHOTOREALISM in VR could be a hugely exciting creative opportunity.

But AMD's chief gaming scientist Richard Huddy has been crunching the numbers, and it seems the barriers to that vision mean we have a wait on our hands.

"Virtual reality is a staggeringly exciting field," he says. "But hardware companies need to produce something 100 or 200 times more powerful than current hardware if we're going to get to the stage where we have complete photorealism in virtual reality headsets. It starts with the facts that, for a person with 20:20 vision, they will need a screen with a resolution of about 8k-by-6k to enjoy photorealism."

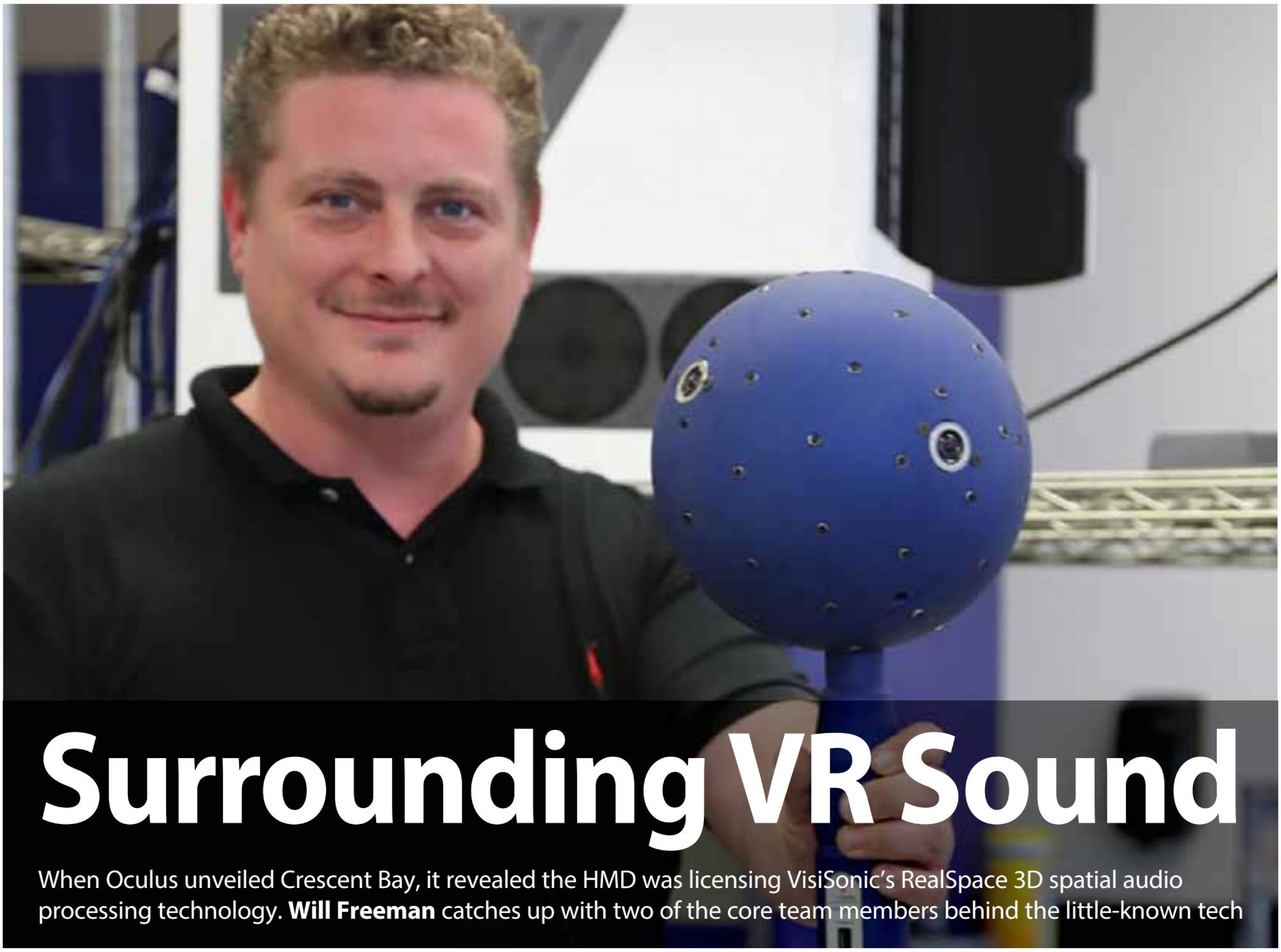
In other words, the human visual system needs about 48 million pixels in the field of view to obscure the fact there are any pixels at all. A typical 1080p set-up today offers around two million pixels, meaning a factor of 24 increase in horsepower is already needed on a flat screen.

For VR, of course, both eyes need their own image. There are enough tricks with square images to pull not to need 48 million pixels for both images. Huddy predicts about 35 million pixels per eye should suffice for VR photorealism. That's still 75 million pixels, taking us to a 35-fold increase compared to a contemporary 1080p monitor.

But photorealism in VR would also need vast improvements in framerate and latency that multiply that factor of 35 by three, clearing the aforementioned hundred-fold increase in horsepower required.

What's more, says Huddy, if you consider the other advances needed to compliment such a leap forward in display and visual technology, it might be more sensible to ponder a 400x-to-1000x increase in horsepower to engender true, convincing VR photorealism that is indistinguishable from the real world.

Graphics hardware companies, then, have plenty to keep them busy in the years ahead. But VR developers will have a wait on their hands if they want to deliver photorealistic games.



Surrounding VR Sound

When Oculus unveiled Crescent Bay, it revealed the HMD was licensing VisiSonic's RealSpace 3D spatial audio processing technology. **Will Freeman** catches up with two of the core team members behind the little-known tech

VisiSonics' interim CEO Gregg Wilkes (above) says it began working with Oculus shortly after it got its hands on the Oculus Rift DK1 and started developing a plug-in for the Unity game engine

Could you tell us a little about VisiSonic? You have an academic background, is that right?

Gregg Wilkes, Interim CEO and EVP, VisiSonics: Yes, we do. It all started about eight-to-ten years back when Ramani [Duraiswami, VisiSonics founder] and a couple of other scientists began working on a couple of projects; one being virtual audio, including conference calling, to help audio catch up with the video, as audio was still a way behind back then.

As they were going down that path they took on a number of other projects, including enabling newly blinded soldiers to cross the street trusting their ears only. This forced the team to really understand how humans process sound, so they could learn to recreate a full 360 immersive experience, so we could then create algorithms to recreate that over stereo headphones. The goal there was to simulate a street corner in a lab through headphones, and that's where VisiSonic's work really began. We were learning how to create audio clues not just to the left and right, but above, in front and behind.

People had been trying that for maybe 20 years, but nobody had truly got it down before.

That brought us to understanding head-related transfer function – or HRTFs [*See 'What is an HRTF?'*]– and we actually started looking at several ways to capture individual HRTFs. We developed and patented a methodology and vehicle in the lab that enabled us to capture HRTFs from individuals in a matter of seconds, compared to the several hours it had taken previously.

Understanding how human beings process sound has allowed us to understand recreating that, and that's let us build a vast library of HRTFs. We've also worked on capturing not only the initial sound, but the thousands of objects that are bouncing off the environment. As that happens, you also have to be able to recreate that environment, including room sizes, wall and object textures, and, importantly, you also have to be able to track head movement. All of that is part of how your brain processes sound.

> ***"We want to give players a reason to use sound in their games, and through their headphones."***
>
> Ramani Duraiswami, VisiSonics

That's where our audio expertise, algorithms and HRTF knowledge comes from, and how we moved on to creating our Audio Video Camera, which is a video and sound capture device. That spherical array includes 64 microphones and five HD cameras, which means we can capture a complete 360 degree rendering of an environment, including the video and audio, and recreate that of a flatscreen, or on HMDs like the Oculus Rift, so wherever you look it is as if your head were inside that spherical camera.

How did that development of the company also see gaming and virtual reality gaming appear on your radar as an opportunity.

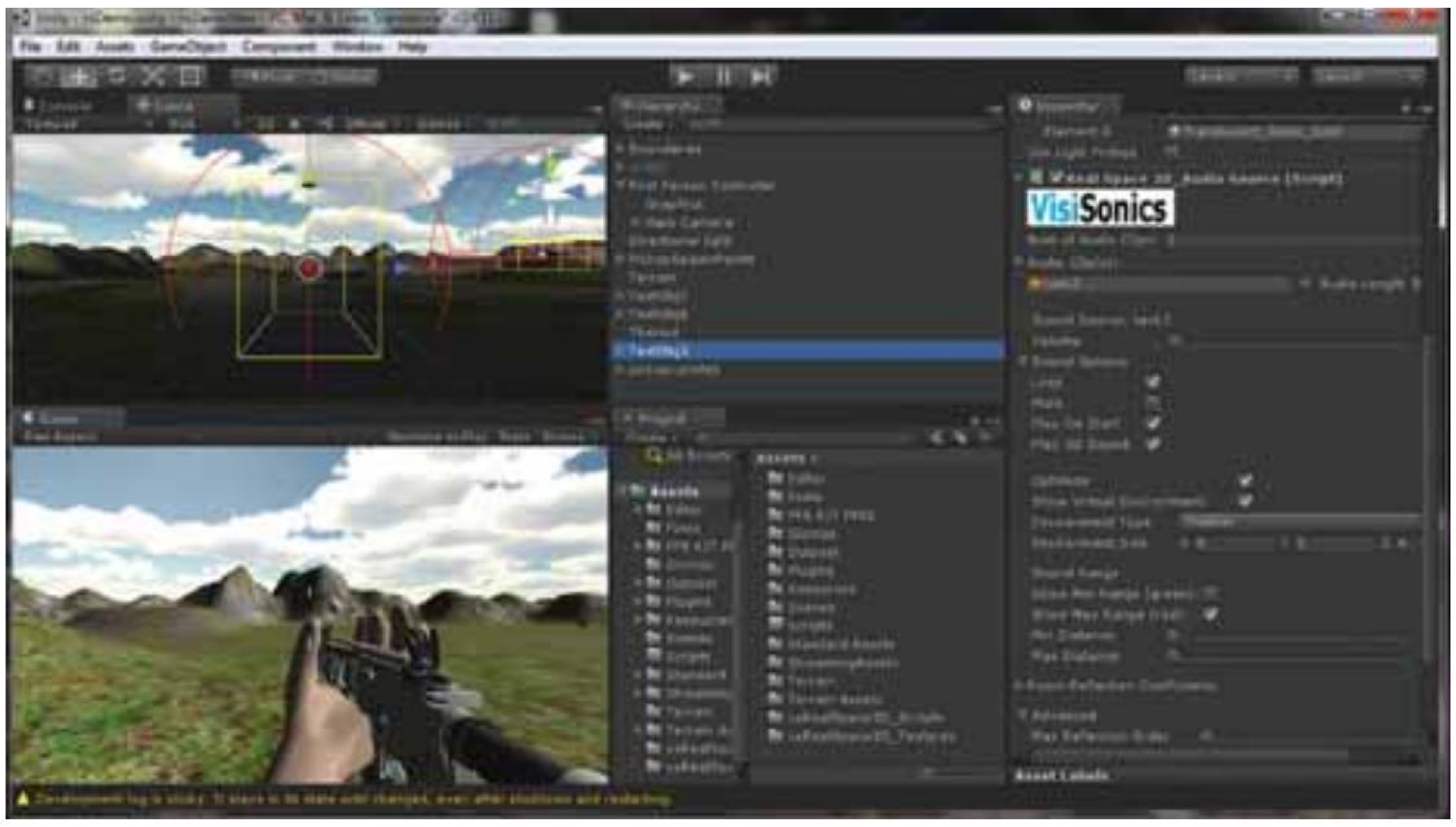
Wilkes: As we were developing the camera, and as we were looking for applications for our algorithms, we looked at several things, and the first was gaming, where pseudo 3D audio technology had been in place for a number of years.

Then, as VR came into its own, through the introduction of Oculus and their Kickstarter campaign, we quickly saw more opportunity.

Now you find yourself working with Oculus and your tech licensed in the Crescent Bay. How did that come to be?

Wilkes: Around a year ago when we were looking at the DK1, we also started at the same time developing our first plug-in, and we did that for Unity. We saw how important the portable experience is to gaming, and Unity kind of owns that space. That drove our direction then.

We were also noticing a lot of people have been through a 3D audio experience as it previously existed, and so there wasn't a lot of credibility around it in the industry. That



VisiSonics' RealSpace3D tech can be used to tell the player the precise location of sound (top left) and is available as a Unity plug-in (left)

WHAT IS AN HRTF?

A HEALTHY HUMAN ear can't just hear a pin drop; it can usually pinpoint exactly where it fell in a space around the listener, even if a room scattered with different objects and textures.

The human ear uses various audio cues to do this, and it is a remarkably complex business. The cues – such as the difference in a single sound to the left and right ears – offer the hearing system ways to estimate position in a 3D space.

But sometimes the difference between the ears isn't enough. Sounds can also be affected by the shape and position of a listener's head, shoulders and ear canal. These changes are head-related transfers functions, and help position a sound.

In a 3D game world, these effects can be synthesised and applied to other sounds as algorithms to offer the player realistic 3D noises that can be positioned in a scene.

"HRTF has almost been the excuse for people to say 'my audio isn't great because HRTF is a mythical thing; if only they could get it right, my game audio would be great'," jokes VisiSonics' founder Ramani Duraiswami. Now he and his colleagues are confident they can change that perception.

drove us to the folks on the virtual reality side, where audio is as imperative as visuals to the immersive experience, because if we can give them what they need, then traditional games people would also accept the technology for their games.

So we reached out to everybody we could in the business, and walking the floors of CES and E3 this year. Eventually people began to pay attention, and at GDC we got the opportunity to demo our technology. That catapulted us into some joint testing, and at some point in time a deal was put in place with Oculus. They wanted to create the best, easiest, most immersive experience and development set in their SDK, and part of that was to be the VisiSonic's RealSpace 3D audio, as part of that 3D spacialised experience.

How does a developer access and work with your RealSpace 3D tech? Will that only be via the Oculus SDK, or will we see more on the plug-in side of things?

Wilkes: It is both. Initially we built our plug-in for the Unity game engine, and we've now made that available as a beta to anybody that is currently using Unity Pro. Any developer can go to our website and download it for free and test it out. And if they have a game they are working on in Unity Pro today, they can implement or change the 'stereo sound' relatively quickly. We have folks change their sounds there in ten minutes.

The second iteration was then to provide a plug-in for the Wwise audio engine, since Wwise is fairly ubiquitous on the triple-A side. It's a compliment and contrast to Unity on the indie side, and helps us get exposure to a much broader audience.

After that – and this is almost completed – is the plug-in for FMOD Studio. We're also working on Unreal as well.

And they'll also be able to access your tech through the Oculus SDK in time?

Wilkes: Yes. The intent of the agreement was to take our technology as it stood and provide that to the Oculus team, so they can iterate and integrate it into their SDK, to make it available to the entire development community in the Oculus VR world.

And what kind of impact do you expect RealSpace 3D to make in VR games?

Ramani Duraiswami, founder and president, VisiSonics: In gaming right now sound is a sort of inferior cousin, if you will. It can be sort of added on, and it's not allowed to take any CPU time. Part of the reason is that giving sound more CPU didn't necessarily produce significant benefits in the past. However, now, with our engine, it is going to be possible to place sounds behind you, around you and above you, as long as the user is using headphones.

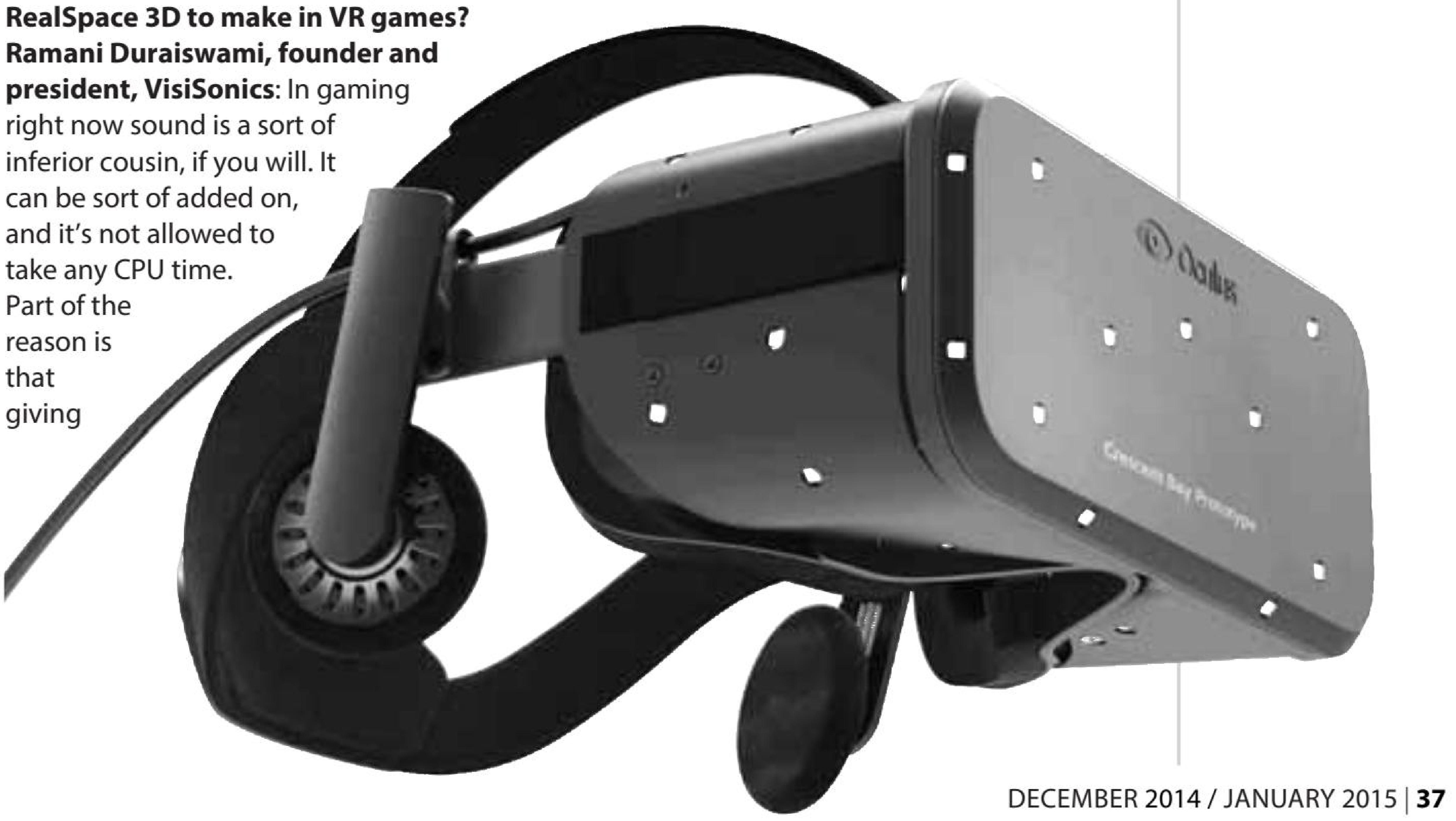
Our technology is completely headphone-based, and with VR I think there will be more and more people using headphones, and with the increase in mobile gaming there will also be more people there using headphones.

We want to give them a reason to use sound in their games, and through their headphones. We want to work with developers trying to help them understand this new palette they can paint with.

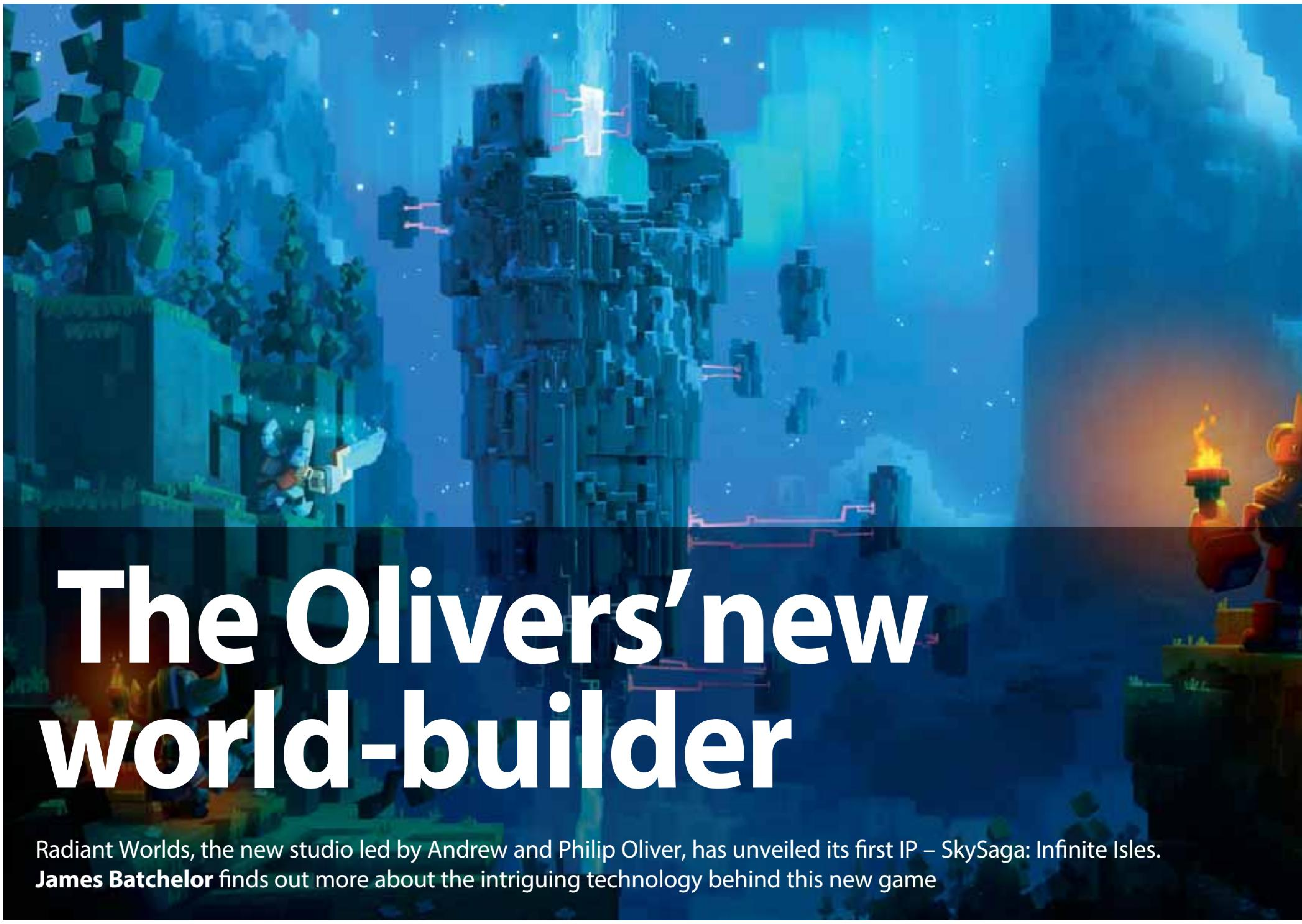
What pricing and licencing plans do you have for RealSpace 3D?

Wilkes: It's been interesting to see the way pricing has evolved at the gaming level over the past couple of years, with what the folks at Unreal have done, and through what Unity has done. I don't think we're committed to any set way.

We've actually done several licensing deals, and each of them is a little bit different based on where that developer is going. I think that will continue to evolve overtime as we move forward. ■



Below: The Oculus Rift Crescent Bay prototype, which uses VisiSonics' audio tech



The Olivers' new world-builder

Radiant Worlds, the new studio led by Andrew and Philip Oliver, has unveiled its first IP – SkySaga: Infinite Isles. **James Batchelor** finds out more about the intriguing technology behind this new game

Radiant Worlds design director Ben Fisher says the studio was inspired by the likes of Minecraft, Spelunky and The Legend of Zelda when developing SkySaga: Infinite Isles

LAST MONTH, UK studio Radiant Worlds lifted the lid on its first project: a *Minecraft*-style online game with a focus on quests through randomly generated fantasy landscapes.

Except these realms aren't as random as they might appear. While the terrain is procedurally generated, this process is guided in part by the Adventure Director, that that ensures a clear objective and plenty of treasure awaits gamers in every instance.

We spoke to the Leamington-based team to find out more about the new technology.

What experience did your team have with procedural generation before working on *SkySaga: Infinite Isles*? How did they prepare for this project?

Philip Oliver, CEO: Using code to generate gaming experiences is as old as games themselves. Using it to generate levels was a classic memory-saving trick of the 8-bit days. We have an experienced team working on *SkySaga*, so many team members already have some experience of this approach.

More recently, some members of the team also worked on a prototype procedural dungeon crawler six months before *SkySaga* began, and learned many lessons from this experiment that grew into what we now call the Adventure Director. Compared to this early work, *SkySaga* goes much further in applying procedural generation to almost all aspects of the game.

What other procedurally generated games and techniques influenced your approach to the structure of *SkySaga*?

Ben Fisher, Design Director: Voxel sandbox games have popularised procedural generation to a mass market audience, so they were obviously an early point of reference. In addition, there are procedurally generated games with an element of pacing and structure that have also been very useful. However, these games often generate content on a 2D plane, so there was plenty of room for experimentation and expansion.

For a specific list of games, there have been useful points of reference in *Minecraft*, *Spelunky*, *Rogue Legacy*, *Torchlight*, *The Binding of Isaac* – even Megadrive classic *ToeJam & Earl*.

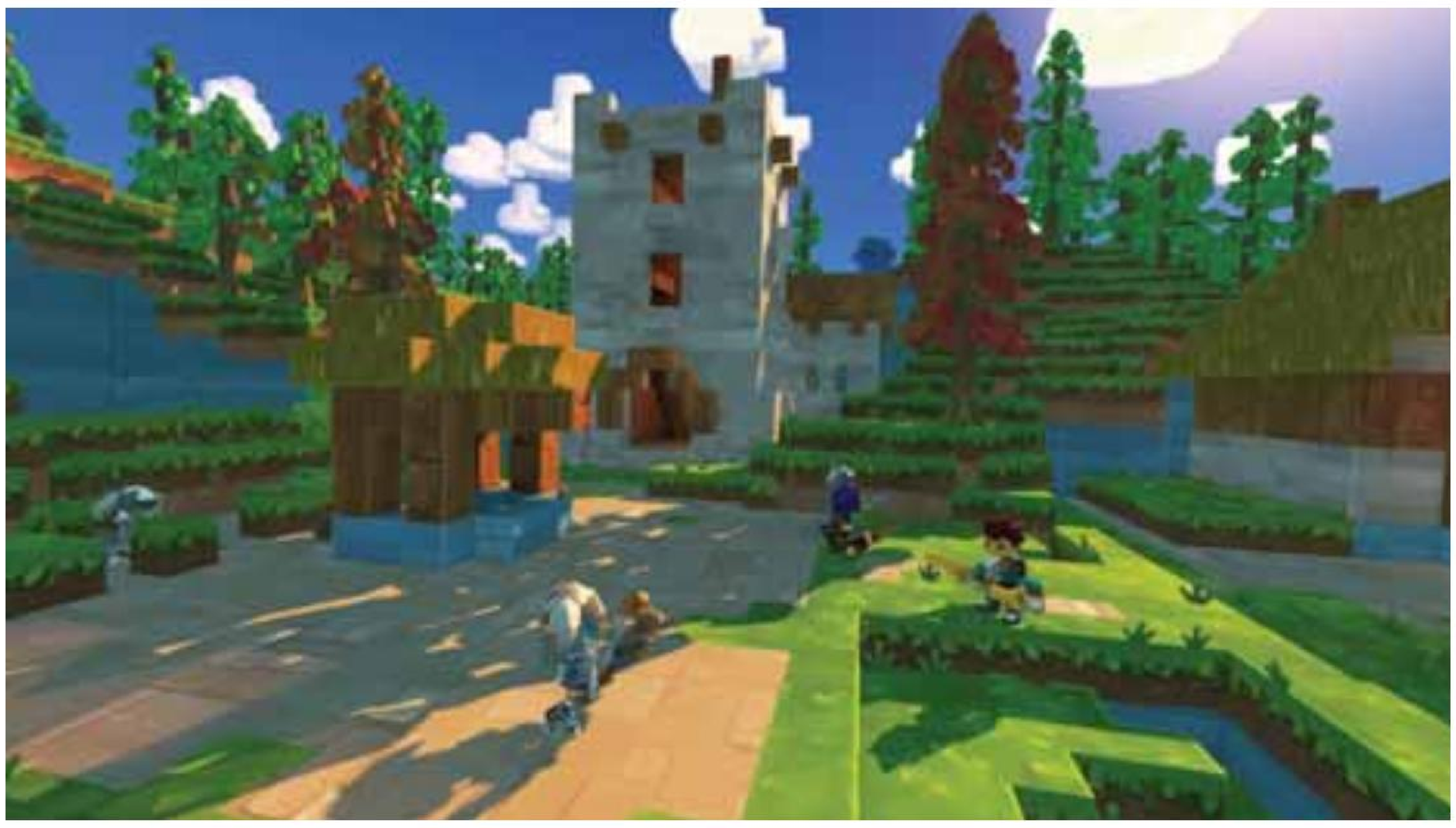
At the same time, the team frequently makes reference to games – *Skyrim*, *The Legend of Zelda* series, *Myst Online*/*Uru*, and more – that are hand-made but provide a reference point for our end-goal for the Adventure Director.

What was the priority when designing this game?

Fisher: We wanted to use procedural sandbox rules to present the player with an infinite number of balanced 'hero's journeys' – equal emphasis is being placed on going on adventures, pushing into the unknown, and uncovering hidden treasures, as it is on returning home and building and customising your safe, creatively-focused play space. We really look at the game as an 'anecdote engine' – we want each journey to be interesting and unique enough that you are eager to share your story with others.

Where did the idea for the Adventure Director originate?

Fisher: Sandbox games have a variety and potential for hidden gems but often lack structure, which undermines pacing. Handcrafted games guarantee structure and pacing, but have a comparatively limited amount of content, and often lack those 'moments of madness' that make procedural generation so glorious. The main idea behind the Adventure Director was to convert the handcrafting process into a set of algorithms that can find a sweet spot between these two reference points.



SkySaga's Adventure Director is able to craft new locations, the building blocks of which are used to craft local weapons and armour

When designing a level by hand, designers apply a set of principles in their construction to guarantee pacing and flow. Members of our level design team are experienced enough to work with programmers and convert these principles into algorithms to apply to the level generation process. Story structure is about delivering a satisfying sequence of interconnected events that create a meaning narrative. Again, breaking down the princples allows us to to add depth and meaning to a player's adventure.

How does the Adventure Director work?
Fisher: The interesting thing about the Adventure Director is the way that the adventures are generated is almost exactly backward from the way the player experiences them. The player is typically drawn to points of interest in an open landscape, hunting for treasure.

Broadly speaking, the overall shape of a landscape is generated using a library of interacting noise layers. The landscape generates spawn points, which trigger subfeatures such as rivers, cave mouths, and clearings. These subfeatures generate their own spawn points, which in turn generate more features and more spawn points, right down to the point where dungeons and caves are populated with scenic objects, treasure chests with lists of random loot, and NPCs generated with equipment and behaviour to suit the biome in which they will appear.

From here we get to the 'special sauce' that makes the Adventure Director powerful. For instance, we interrogate generated locations to ensure there is a flow that results in a main story and an exit route. We pull secondary points of interest from a list to guarantee there are interesting 'pattern breaks' from that basic story, and we allow those secondary features to generate more features and spawn points. We ensure that things like castles are built from stone local to that biome, and that NPCs wield equipment made from local ore. The properties of that ore then influence the behaviour of the equipment.

Why design modular-based objects when the game worlds can be randomly generated?
Fisher: There are moments where, as a level designer, you want to apply principles like line of sight and cover, or to guarantee that the route the player can see is different from the one they can travel.

To achieve that level of finesse, it's often a faster process to hand-build a set of modular rooms, and then garnish them with a final layer of procedural details. It also allows us to design things like castles or dungeons which branch and grow based on the rules that combine their rooms, but often tell a better story when a particular room has a strong handmade theme.

A library or a torture chamber becomes a more interesting anecdote for the player to share, particularly when those sorts of locations intersect with procedural rules and become a flooded library, or a torture chamber with a collapsed wall that leads eventually to a natural cavern.

How do you ensure the Adventure Director provides a fully-formed games experience?
Fisher: The name of each location the player visits is also generated by the Adventure Director, and provides some clues. When the player enters this location, we back up this clue by ensuring that the main feature has visual cues that underline its importance.

Do you worry that the bulk of the content your game is generating might be missed by players? How can you handle this?
Fisher: One of the foundational goals of the Adventure Director is that as we amass a library of rules and relationships, and as we train the Adventure Director in ways of combining them, we can add content to our 'anecdote engine' faster than players can use it up.

We want the game world to feel larger and deeper than a single player's experience. To reinforce this feeling, we provide functionality to take photographs while on adventures, and to share them with other players in the game.

Art attack

Artistic creativity comes from the artist themselves, but they still need the right tools to help with the job at hand. **Craig Chapple** rounds up a list of eight texturing tools to bring your game world to life

GRANITE

Company: Graphine
www.graphinesoftware.com

THE GRANITE SDK can be used for texture streaming and virtual texturing in 3D games and can be integrated with any 3D engine, such as the available Unity and Unreal Engine plugins.

Used in titles such as The Farm 51's upcoming sci-fi title *Get Even*, the middleware is designed to minimise memory usage, storage size and loading times, while also enabling the use of large amounts of texture data.

The tool was named one of the top tech in games in the Develop 100 Tech List.

SUBSTANCE DESIGNER 4

Company: Allegorithmic
www.allegorithmic.com/products/substance-designer

NOW IN ITS fourth iteration, Substance Designer is a node-based texturing tool that helps developers create Substance files or bitmap textures.

New features to the latest version include fresh GPU-accelerated baking, a new noise generator and hundreds of revised editing tools and filters.

The tool also has new physical-based rendering and shading abilities, a technique that more accurately represents the way light behaves when it hits an object in the real world.

SUBSTANCE PAINTER

Company: Allegorithmic
www.allegorithmic.com/products/substance-painter

Another texturing tool from Allegorithmic is the new Substance Painter 1.0. The 3D painting app is designed to make the creation of textures for 3D assets easier, and features support for 4K high-definition and custom shaders, as well as allowing developers to add age, decay and fractures to textures for both 2D and 4D objects.

The tool also includes a customised version of Popcorn FX's particle editor and a new user interface.

PHOTOSHOP

Company: Adobe
www.photoshop.com

ADOBE'S PHOTOSHOP HAS long been the standard tool for many artists with its vast array of features making it a flexible tool for editing art.

One of its many uses is creating textures that can be used in games, such as through layer styles, filters and the brush tool.

One of the latest features to Photoshop is the Creative Cloud Library, through which users save their projects on the cloud, and then pick it up again from another desktop or mobile device.

ZBRUSH

Company: Pixologic
www.pixologic.com

ZBRUSH IS A sculpting and painting program that can be used for games.

The built-in PolyPaint tech meanwhile is designed to mimic the painting of real objects in the digital space, and can be done without first assigning a texture map. This means a texture map can be created at a later time, and the painted surface can then be transferred to the map.

Texture resolution also need not be decided in advance, as existing surface painting can be moved to a larger map if plans change.

MARI

Company: The Foundry
www.thefoundry.co.uk

THE MARI 3D paint tool lets artists paint directly onto 3D models, and can support textures of up to 32K x 32K pixels and thousands of textures per model across different channels.

Features include a UV-less workflow (PTEX) that lets users adjust texture size on a per-face level, and masked filters for colour correction, noise and masked blend constant colour.

The tool has been used in a number of games including LucasArts' now cancelled but still impressive looking *Star Wars 1313* title.

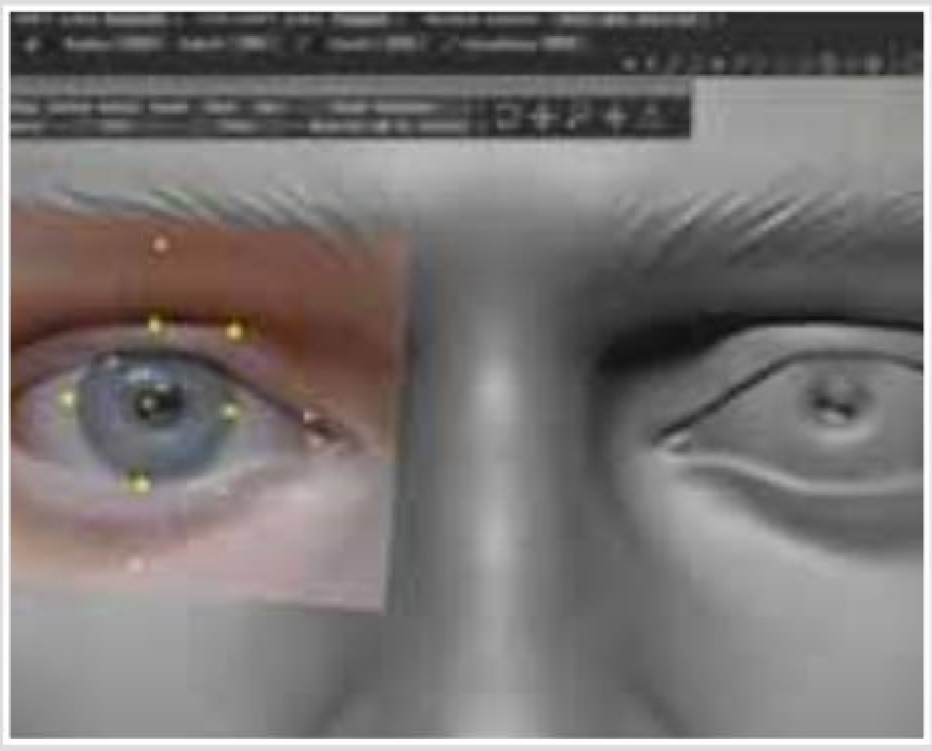
MUDBOX

Company: Autodesk
www.autodesk.com/products/mudbox/overview

AUTODESK'S MUDBOX IS a 3D sculpting and texture painting toolset used for all different types of games to create 3D characters, environments, props and concept designs.

Features include tools for symmetrical retopologising, support for Intel HD graphics 4000 and a caliper tool for proportional measurement.

A free trial is available for devs on Windows and Mac to test out the software, while students can get the tool free for three years.



3D-COAT

Company: Andrew Shpagin
www.3d-coat.com

3D-COAT OFFERS a series of tools for the modelling process, including voxel sculpting, UV mapping and CUDA acceleration. It also offers cross-platform support for Windows, Mac and Linux and comes in eight different languages.

Ptex support, meanwhile, means artists can create textures without UV unwrapping, and its per pixel painting approach allows layered colour and displacement painting over low-poly and high-poly meshes without geometry distortion.

KEY RELEASE

Capture kings

Xsens rolls out its latest, most advanced motion capture products to date

MO-CAP EXPERT XSENS has revamped its flagship range of products in the form of the new MVN Awinda and MVN Link.

Awinda is a collection of inertial motion sensors that attach to key parts of the body like arms, legs and head via special straps, while Link is a traditional full body motion capture suit.

The biggest improvement in the new versions is the quality of data captured. While previous models captured motion at 120Hz, both Awinda and Link now capture at 1,000Hz.

The dramatic increase in accuracy has also enabled new factors to be taken into account.

"The old systems assumed the suit's trackers were on a flat floor so we revamped MVN Studio with a completely new Motion Engine," explains product manager Hein Beute.

"This new engine detects vertical data when doing things like walking, hanging on a bar, climbing or even walking. This will save animators a lot of time since it eliminates the need for cleanup after recording."

Improved accessibility is also a key selling point. MVN Link now has stretchable zippers that grant easier access to the sensors, and both models feature much smaller, lighter trackers, making them more comfortable for actors during long performances.

ON LOCATION

The MVN line is famed for its robustness on outdoor shoots, and Beute says the new versions are no different.

"MVN Link's wired trackers can now withstand a force of up to 50kg due to a strain relief construction using Kevlar-reinforced wires. Additionally, the suit's Body Pack can now withstand a load of 100kg with new rugged connectors."

The suit's wireless range has also been greatly improved, and the systems now have a buffer time of two minutes: even if an actor goes out of Wi-Fi range, all motions will still be captured. And battery life has been more than tripled to six hours in Awinda and 9.5 hours for Link.

The MVN range has been used by a wide range of studios around the world, including *Sunset Overdrive* dev Insomniac Games. Beute says Xsens' customer base has been instrumental in shaping these devices.

"The new product line has been built from the ground up; it is a completely new hardware platform," he says.

"We've listened to feedback from our users to reinforce the aspects they loved in the last system, while also making the jump from pre-viz to production-quality. It's easier to work with, more accurate and faster than ever before.

"A new user is able to set up an MVN system within 30 minutes with our quick guide. So now they can take a professional mo-cap studio anywhere."

What is it: Revamped models of Xsens' leading mo-cap products: the MVN Awinda motion sensors, and the full body MVN Link mo-cap suit.
Company: XSens
www.xsens.com/products/xsens-mvn

Main: A major new feature of both MVN Awinda and Link is the ability to capture height data during mo-cap sessions

Sound production on Halo: The Master Chief Collection *was a gargantuan project, with four full games' worth of audio, effects and music to be optimised for Xbox One*

HEARD ABOUT

Halo: Audio evolved

John Broomhall talks next-gen Halo with Paul Lipson, senior audio director for 343 Industries/Microsoft Studios

EVEN FOR AN experienced audio director like Paul Lipson, *Halo: The Master Chief Collection* is a monumental project.

It's an audacious Xbox One homecoming for the franchise, encompassing *Halo: Combat Evolved Anniversary, Halo 2: Anniversary, Halo 3*, and *Halo 4* in one inclusive package and unlocks early access to the *Halo 5: Guardians* Multiplayer Beta and *Halo: Nightfall* – the new live-action digital series made in partnership with Executive Producer Ridley Scott and Scott Free TV.

For Lipson it was both a joy and a challenge: "I've been a huge *Halo* fan since the original Xbox release *Combat Evolved*, an innovative and aesthetically ground breaking title which transformed the way I look at game audio – it was a creative landmark.

"However, moving *Halo 1* to *4* over to Xbox One with a brand new unified UI and at 1080p/60fps – which many said was impossible and crazy – was a Herculean task. We're looking at four different integration schemes and audio engines that need to play nice together.

Lipson continues: "Meanwhile, *Halo 2: Anniversary* hitting its 10th anniversary was a massive project in itself, with a full update of all audio content: 198 minutes of all-new music, over 16,000 new sound and foley assets, and 58 minutes of all-new cinematics with all bespoke post-production content.

"One of the coolest features in *Halo 2: Anniversary* is that we included both the legacy sound and the new sound – literally two complete sound trees running side-by-side. You can play the game in remastered mode, then instantly switch to the legacy content running in perfect parallel. It's quite astounding and really showcases the power of the Xbox One and also how far game audio has come in a decade. We think fans will appreciate this feature, and it will probably spawn lots of posted DVR clips."

MASTERFUL MUSIC

Lipson partnered with Skywalker Sound and multiple Grammy-winning engineer Leslie Ann Jones to record 85 members of the Skywalker Symphony Orchestra (players from the San Francisco Symphony and Ballet), 40 singers from the SF Opera Chorus, and 28 singers from the Boys' Chorus. He also commissioned two new cues from guitarist/producer Misha Mansoor (of Periphery and Animals As Leaders fame), and brought back guitar hero Steve Vai for work on the main themes. Meanwhile, Charles Deenan and his team at Source Sound handled the huge movie post-production effort.

"We have a strong relationship with the American Federation of Musicians (the largest musicians' union in North America), and we've had great success recording with them," Lipdon says. "They love games – and it's fun to hear them come in after a night of playing Mahler or Rachmaninov and say, 'wow, it's so awesome to stretch out and play this amazing music'.

"The AFM players have been instrumental in helping us shape the gorgeous sound of our *Halo* soundtracks. Leslie Ann Jones and the Skywalker Sound team also make all the difference: their expertise coupled with one of the finest recording environments in the world really brings the music to life. I'm lucky to be working with such a talented group of people – and I think our results reflect that."

On reflection, Lipson is stunned that the work was completed within such a tight timeline: "We never sacrificed audio quality – from the very first note recorded to the very last moment of the game mix. Bringing all of this amazing talent together and focusing our collective energies to making something this cohesive is certainly a bright moment and a satisfying feeling. We're excited to share our results with the world – we hope you'll join us in celebrating this next chapter in the *Halo* universe!" ■

John Broomhall is a game audio specialist creating and directing music, sound and dialogue. Find him at: **www.johnbroomhall.co.uk**

UNREAL DIARIES

Great VR for new platforms

Epic Games lead engineer Nick Whiting discusses virtual reality's value proposition

The Showdown demo (Main) showcases Unreal Engine 4's support for Oculus Rift's Crescent Bay prototype

VIRTUAL REALITY REPRESENTS the confluence of many factors happening at just the right time, and the excitement continues to spread throughout the development community.

Following the debut of the Unreal Engine 4 *Showdown* demo for the Oculus Rift Crescent Bay prototype and confirmation of UE support for Samsung Gear VR, Epic asks VR expert and lead engineer Nick Whiting for his thoughts.

"Compelling VR is comprised of three main ingredients: the audio-visual experience, the tracking of the player's movement, and the content," explains Whiting.

He adds that smartphones have driven up small-screen quality as costs have plummeted: "Current VR experiences owe their existence to smartphones.

"Advances in computer vision and sensor miniaturisation mean that it's now possible to get sub-millimetre tracking on a desktop computer. That's essential for the experience, because the simulation leads to sickness if it diverges from what the player is doing in the real world.

"The gestalt of all these factors is presence, where you actually feel grounded in the VR world. Up until this point, it hasn't been technologically feasible or economically viable to put all the pieces together and offer a great VR experience to the masses."

GIVING TEAMS A LEG UP

With Unreal Engine 4, Epic's goal is to make the technological challenges of VR invisible to users.

"Devs shouldn't have to worry about the technical details or tricks we do under the hood to optimise our rendering and latency for VR," Whiting insists. "They should be able to focus on making a great experience. That's what we try to deliver. We want teams to be able to download the engine, put on a VR device, and just start iterating on their ideas."

Whiting observes that as VR is relatively new, the community is still defining the language used to interact in a VR world: "How do players move around? How do we display information to the user? How do we give them feedback? There aren't simple answers to these questions, so everyone's throwing ideas at the wall, and seeing what sticks. We want to make sure that developers can go from zero to trying out an idea as quickly as possible."

Aside from working on VR, Whiting helps lead the Blueprint team at Epic.

"Blueprint visual scripting basically lets you connect little boxes together in order to create behaviours in the engine," he says. "Each one is very simple on its own, but when you start combining them, you have something much more complex – no programming required. In fact, our two most recent VR demos, *Couch Knights* and *Showdown*, were created entirely in Blueprints without a line of game code.

"We're always pushing to make that system even more powerful. Nick Donaldson, one of our designers, built a small game in which multiple players could enter the same shared virtual space together, with their real-world motion mapped to their characters in the game, in under 20 of those functional blocks. That still blows my mind."

FOSTERING THE VR COMMUNITY

With big players like Facebook, Sony and Samsung championing VR, developers are compelled to take the risk of creating new experiences for their platforms.

"With several billions of dollars being thrown around in VR at the moment, I don't think anyone can say it is going to fizzle away," says Whiting. "Look at how many people are attending conferences around the world. It's really captivated people's imaginations.

"But without great software, the hardware is nothing. You have to have both sides of the equation. We work closely with not only Oculus, but Sony and other hardware providers to make sure that it's as easy as possible to create great content. If we ruin it this time around, it might be a very long time before people are willing to give VR another shot."

Unreal Engine 4 offers VR support out of the box and is available at **unrealengine.com**.

UPCOMING EPIC ATTENDED EVENTS

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January 6th to 9th
Las Vegas, Nevada

Game Developers Conference
March 2nd to 6th
San Francisco, California

EGX Rezzed
March 12th to 14th
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MADE WITH MARMALADE

The right tools for the job

Marmalade's SDK is proving to be a very powerful tool indeed, helping various studios bring their titles to multiple platforms. We look at some of the biggest successes from the past 12 months

YOU'RE DONE. YOUR labour of love is live in-store, the downloads are rising and the dollars are rolling in from the native app that you've made. So what's next?

Your native tool of choice has done you well, but now your mind is turning to the other mobile and TV platforms that are growing in consumer popularity – you naturally want your game there, too. Perhaps it's time to consider a new way of working and look at the ever-increasing array of game dev tools on the market.

Your goal will be a tool that is flexible, open and immensely powerful, one that will give you the ability to compile straight to native machine code without any performance overheads; that fully supports a plethora of middleware and services modules and won't stifle your creativity and will enable you to take one codebase to multiple devices.

Enter Marmalade, the cross-platform game dev tool. Let's take a closer look at some recent releases that have taken advantage of just a few of the features of this increasingly popular and versatile game dev tool.

1. SILESIA GAMES' BEYOND SPACE

Because of competition in the market, Silesia Games knew the action and the graphics of their game really needed to stand out. With that in mind, Marmalade provided a critical foundation for delivering the necessary level of performance. For *Beyond Space*, they created their own proprietary advanced 3D graphics engine, built on top of the Marmalade SDK.

2. HARDLINE STUDIOS' ALPHA WAVE

Cross-platform was a pivotal part of the business plan for Hardline Studios, and the objective to get their game on as many stores as possible was the key reason they selected Marmalade. A big challenge when making the game was ensuring it looked and played the same across all platforms and with Marmalade's engine; they were able to do just that. They also loved the easy deployment system, the platform abstraction and the memory manager.

3. SNAZZLEBOT'S COINS AND STUFF

The ability to deliver to multiple platforms was a big highlight for the Snazzlebot team, as was being able to use Lua for development with Marmalade Quick. The team mainly use Windows PCs for development so being able to deploy directly to iPhone from Windows was another major draw. The Marmalade Quick Lua-based RAD environment included with the Marmalade SDK feels very familiar if you have a Javascript background, so they found a simple yet very powerful and effective language for building games.

4. MICRO MACRO GAMES' MORPHOPOLIS

Micro Macro Games really like the flexibility to customise Marmalade to suit their preferred workflow and build a lot of their own tools, in-engine, using Marmalade. For *Morphopolis*, they have built a custom 2D skeletal animator, including support for texture atlasing, rigging and keyframe-based animation; a scene editor, where they composited the game artwork; created paths for characters; and placed the game entities, objectives, cameras and animated objects.

For them, an editor using the game engine was a huge time saver due to the code duplication, and they could even demo the editor capabilities to others on a tablet. They found that the main benefits of Marmalade were C++ development for mobile, platform abstraction and ease of deployment, especially when developing for an unfamiliar platform. Compiler and deployment systems and the ease of turning code into an app on a device was also very valuable.

5. 22CANS' GODUS

Using the Marmalade SDK allowed the team at 22cans to develop this ambitious game in C++ while enabling them to develop and have it run on all four target platforms without a performance overhead and with minimal code changes.

The *Godus* team loves Marmalade because it's lightweight, flexible and robust, which is essential for unifying the development process across all their platforms.

Why Marmalade matters
Studios love the cross-platform functionality but also the open, flexible approach it enables.
www.madewithmarmalade.com

1

BEYOND
SPACE

2

ALPHA WAVE
SURVIVAL . ACTION
HARDLINE studios
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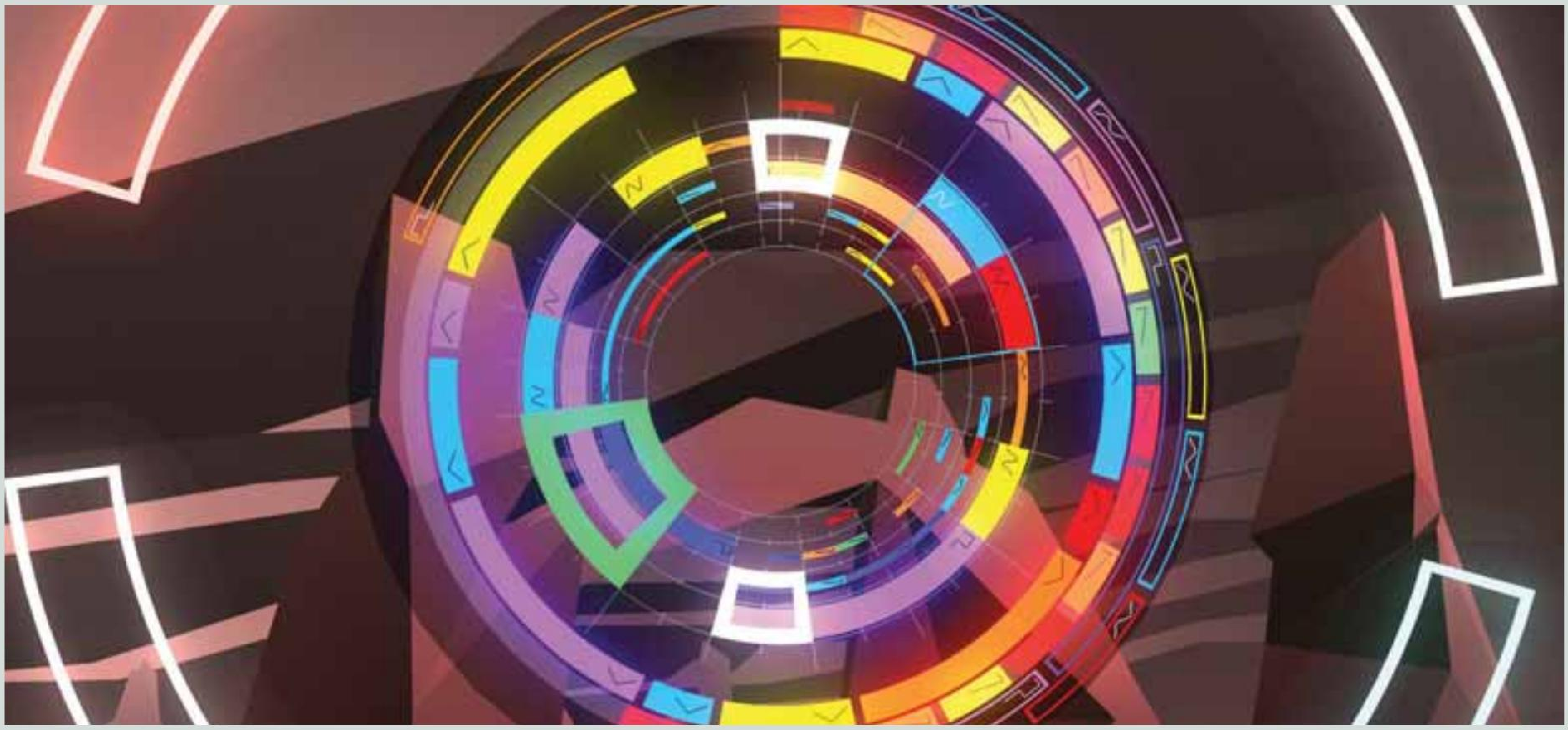

UNITY FOCUS

Making music with Unity

We speak to developer **Samantha Kalman** about her crowdfunded puzzle and music game Sentris

FOR MOST PEOPLE, the term 'music game' still conjurs up images of *Guitar Hero*, *Rock Band* and *SingStar*: playing along to popular pre-recorded songs.

But Timbre Interactive founder and director Samantha Kalman wanted to develop something different: a game in which users are as much creating music as they are playing it. The result was *Sentris*, a crowdfunded puzzle game that was released through Steam Early Access in August.

Like many independent developers, Kalman opted to power her game with Unity – a no-brainer given her considerable history with the engine.

"I'm in the unique position of being a very early member of the Unity community," she tells *Develop*. "I discovered it at version 1.0, back in 2005 or so. I had only learned a little bit of programming at the time, and I started using Unity to learn how to make games. I know the engine quite well by simply having used it for such a long time."

Kalman cites two major factors in her decision to use Unity: its usability and its affordability. The range of tools, she says, enables devs to "focus their attention on the most important parts of development".

"And it's free, so virtually anybody with a computer can start making games with it," she adds. "Even the paid version costs are affordable, so small teams only need to allocate a tiny amount when budgeting their crowdfunding goals."

Sentris has a unique graphical style, with the different elements and instruments of each song arranged in a circle. Kalman shares the secret of how she gave the game it's striking look.

"The visuals in Sentris are all meshes built procedurally with the Mesh class and Mesh Topology," she explains.

> ***Always be creating. Learn how to improve from anywhere and anyone you can.***
> Samantha Kalman, Timbre

"Calculating meshes was the best way to achieve the very clean look of the circles while allowing them to distort and animate in non-uniform ways. I also used serialised properties and runtime modification quite a lot. Those are Unity's bread and butter in my opinion."

A NEW BEAT

As Kalman gears up for the game's Spring 2015 full release, she plans to continue updating the game with fresh content and features, particularly once the next iteration of Unity has been released.

"I'm really looking forward to 5.0 so I can leverage the audio mixer, new audio effects, and a ton of under-the-hood audio improvements," says Kalman.

"The response to *Sentris* so far has been great. The community of players is growing and doing really cool things with the game. Someone set up a Twitch Plays *Sentris* account, and I spent an afternoon making music with people from all over. Another player managed to hack the game and replaced all the bass instrument recordings with samples from the old television show *Alf*. Watching his video was really trippy.

"Generally, my players are just excited to see what I do next with the game – and I plan to do a lot more."

When asked what advise she would give to new Unity users, Kalman said: "Always be creating. Make small games. Make weird games. Make personal games. Make games with friends.

" Learn how to improve from anywhere and anyone you can. Ship a lot. Shipping is the best way to grow as a developer. Ship your failed games. Keep failing until you fail at failing, then success will be waiting for you." ■

Sentris
Developer: Timbre Interactive
Publisher: Timbre Interactive
Platform: PC
www.sentrisgame.com

Timbre Interactive founder Samantha Kalman says Sentris' striking visuals are all meshes built procedurally with the Mesh class and Mesh Topology

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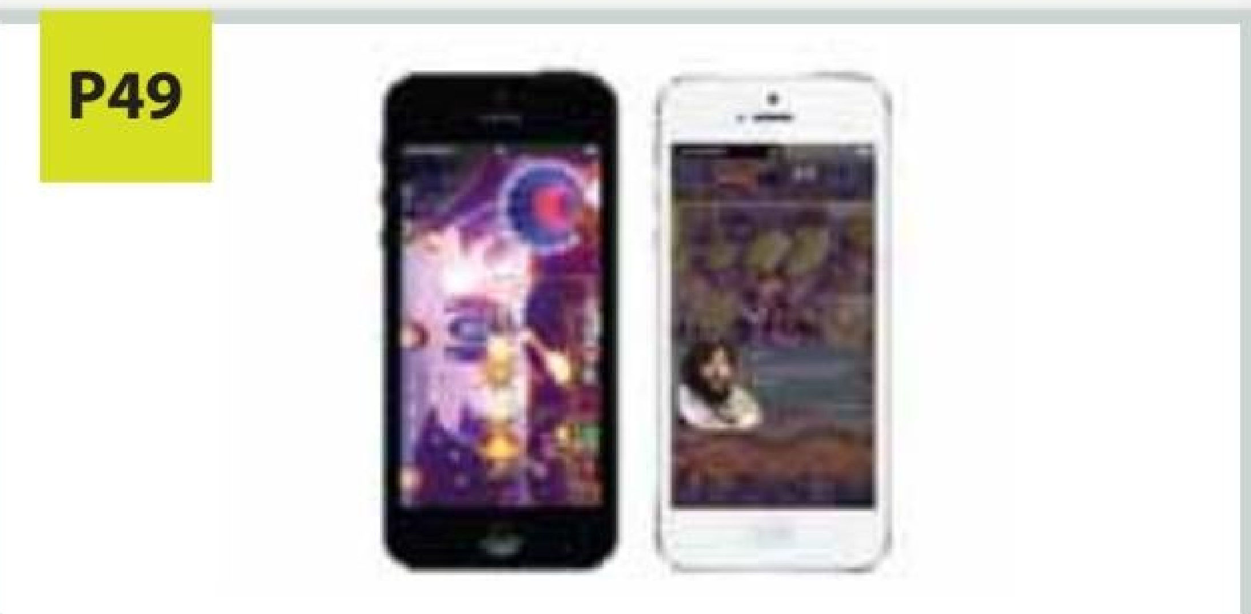

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E: enquiries@axisanimation.com
W: www.axisanimation.com

GLASGOW-BASED FIRM Axis works with a number of games developers and publishers on creating animation and VFX content for cutscenes, trailers and commercials.

The company deals with all areas of production: from idea and script creation to the direction, design and concept to the animation, rendering and post-production.

Once most famous for the *Dead Island* trailer in 2011, Axis' portfolio now consists of numerous high profile projects such as the trailers for *Crackdown* on Xbox One, *Dead Island 2* and the trailer and in-engine cutscenes for *Alien: Isolation*. The latter saw Axis involved in casting, script editing, directing duties, camera work and editing.

"Clients can come to Axis with an already established script or a loose concept idea, it doesn't matter," says Axis MD Richard Scott (*bottom right*).

"A versatile team of directors, art directors and concept artists will take any brief on board and pull together original proposals.

> ***Our versatile team of directors, art directors and concept artists will take any brief on board.***
>
> Richard Scott, Axis

"We back up the solid creative team with a dedicated R&D department that develops our pipeline and are constantly looking for ways to improve the quality of our execution, efficiency and offer tighter technical integration with clients."

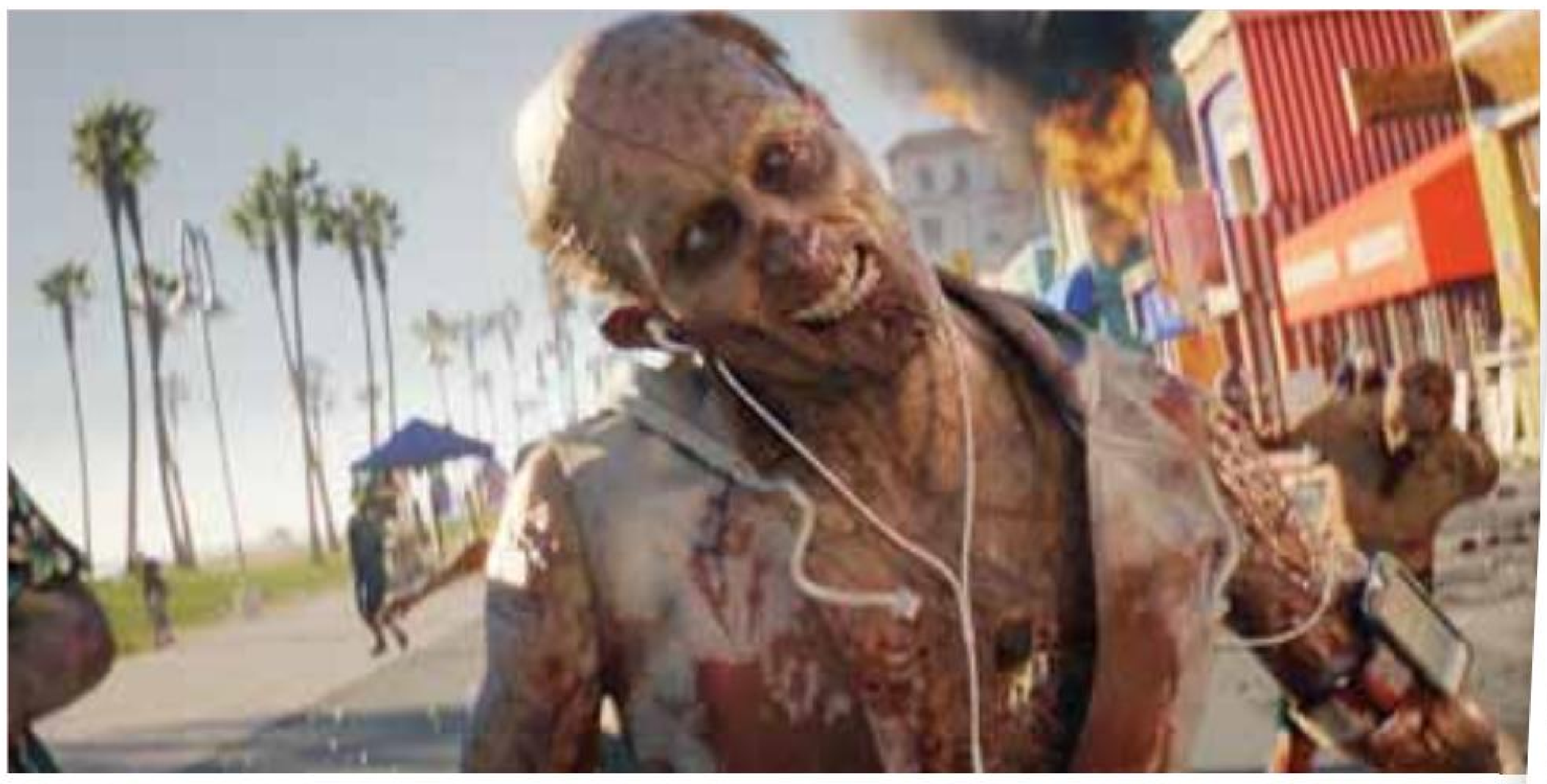
He adds: "Whether it is in a game's cutscenes or a trailer for E3, our goal is to tell the best story and engage the audience. This is what we feel is important for developers and publishers, our perspective on your story and our ability to create compelling characters with great performances in amazing worlds that viewers will watch and share."

As well as its core services, Axis expanded its offerings with the launch of digital production company Flaunt in 2009. More recently, in 2013 it created a new branch called AxisVFX, which caters for high-end CGI and visual effects projects for live action in TV, film and commercials.

And the firm is keen to continue building on its services in future.

"We are currently developing new tools and technologies for more efficient integration into real-time game engine technologies," says Scott.

"This is focused on Unreal and Unity and is designed to utilise as much of our current pipeline as possible. We are really excited about the future possibilities of this for our video games clients."



Axis has worked on numerous game trailers including the upcoming Dead Island 2 (above)

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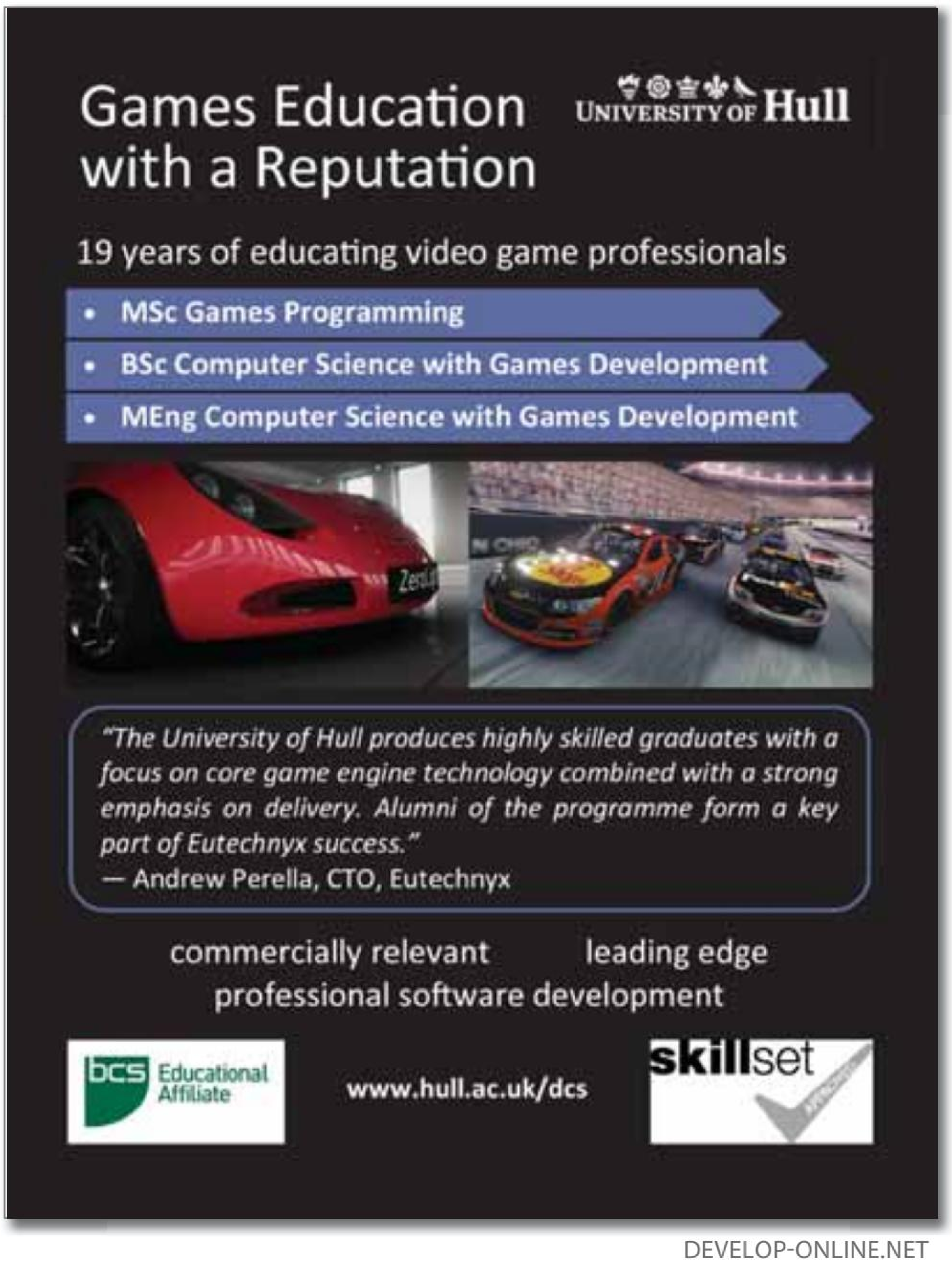

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— Andrew Perella, CTO, Eutechnyx

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TOOLS SPOTLIGHT

This month: **Corona SDK**

Corona Labs Inc.
1900 Embarcadero Rd.,
Suite 207
Palo Alto, CA 94303
USA

E: info@coronalabs.com
W: www.coronalabs.com

MOBILE GAMES MIDDLEWARE firm Corona was last month purchased by US monetisation outfit Fuse Powered.

Its Corona SDK is built for the development of cross-platform 2D and 2.5D games, apps and eBooks.

"In just a few lines of code you're able to use cinematic shader effects, particle systems, physics, and much more," says Corona founder Walter Luh (*below*).

"Unlike competing technologies, Corona supports a full range of key services as first-class citizens, ranging from social networking to monetisation. We also have a robust set of plugins directly available from the companies behind popular third-party services."

Luh says its USPs come down to speed of development, community and the experience. He says it's the fastest SDK for 2D and 2.5D games, and describes it as the natural heir to Adobe Flash.

"That's where we put our focus and it shows," he says. "For example, we have customers who also use Unity for 3D games, and they tell us Corona really just hits the sweet spot much better when it comes to 2D, much better than anything else that's out there."

Despite the acquisition by Fuse, Luh says it's business as usual for Corona.

"We're busy reacting to a fast-moving market, especially changes driven by Apple and Google, that affect Corona developers," he says.

"More broadly, the acquisition is a really great thing for Corona. Because the Fuse and Corona teams are so complementary, we're going to be able do a lot more things together that would have been very difficult to contemplate alone. We're really looking forward to bringing some of those things to light."

As well as working on a new GUI called Composer, one major offering Corona aims to add in future is a marketplace for plugins. Luh says it's a gap in its offerings that it's been wanting to fill for some time and believes it will be a useful addition to its community.

Corona founder Walter Luh (left) says the Corona SDK is the fastest around for 2D games

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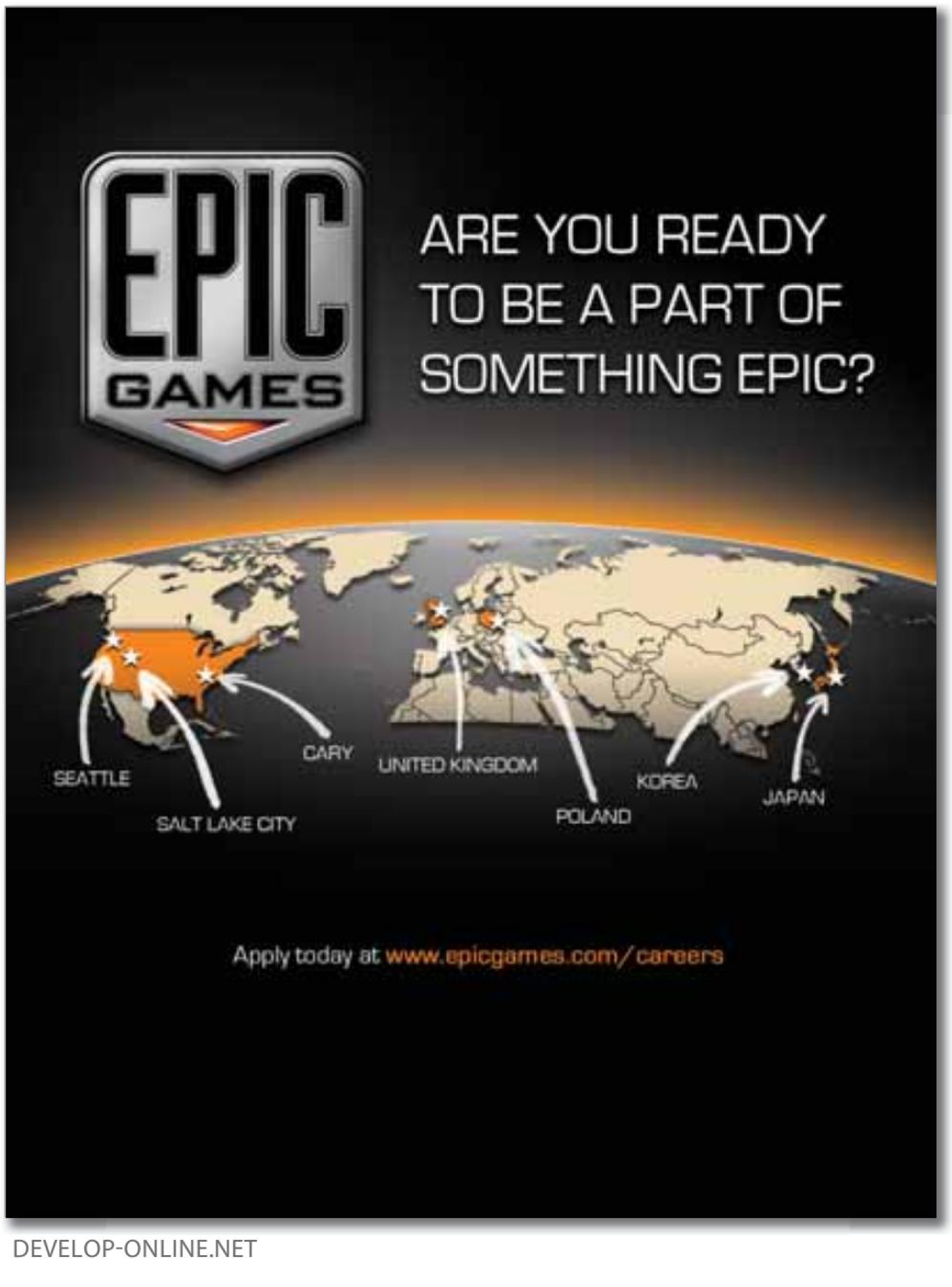

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THIS MONTH: OXFORD

Lee Bradley explores the community of studios that has developed around one of the UK's most prestigious academic institutes.

OXFORD UNIVERSITY

The venerable institution has strong links with the Oxford development community, helping to establish new studios and providing graduates to established outfits.

Rebellion founders Jason and Chris Kingsley graduated from Oxford University.

NaturalMotion founder Torsten Reil and Rebellion founder Jason Kingsley are both graduates of Oxford University's Zoology department.

NaturalMotion was founded as a spin-out company from Oxford University.

AUDIOMOTION STUDIOS

1997 – Present

Notable Games:
Far Cry 3
Alien: Isolation

Provided in-game and cutscene sequences for Rebellion's Alien vs. Predator

REBELLION

1992 – Present

Notable Games:
Alien vs. Predator
Sniper Elite III
Rogue Trooper

EXIENT

2001 – Present

Notable Games:
Diggs Nightcrawler

Exient and New Star Games have both employed Team17 co-founder Martyn Brown for business development consultancy.

NEW STAR GAMES

2003 – Present

Notable Games:
New Star Soccer

*New Star Soccer and Fluid Football represent two of the most popular football games on iOS and were created within a few miles of each other.**

NATURALMOTION

2001 – Present

Notable Games:
Backbreaker Football
CSR Racing
Clumsy Ninja

High Score provided music and crowd effects for Rebellion's PDC Darts.

High Score provided the sound design and music on Exient's iOS title, X2 Football 2010.

HIGH SCORE PRODUCTIONS

2004 – Present

Notable Games:
War Thunder
FIFA (mobile & handheld)
Harry Potter for Kinect

High Score and Excalibur have separately worked on the IL-2 Sturmovik series, with Birds of Prey and Battle of Stalingrad respectively.

EXCALIBUR PUBLISHING

2004 – Present

Post Master
Farming World
European Ship Simulator

High Score has worked extensively with Electronic Arts, the UK HQ of which is based in Guildford, which we'll explore next month.

ELECTRONIC ARTS (UK)

1986 – Present

Notable Games:
Dungeon Keeper
Theme Hospital
Burnout
Harry Potter series
Need for Speed series

FLUID GAMES

2008 – Present

Notable Games:
miCoach
Fluid Football

NEXT MONTH: GUILDFORD

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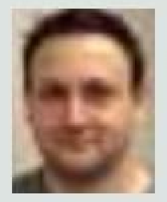
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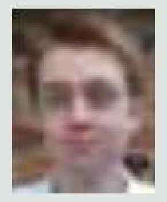
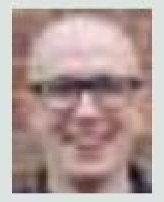
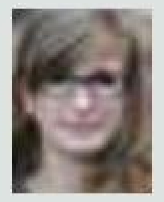
Michael French
mfrench@nbmedia.com

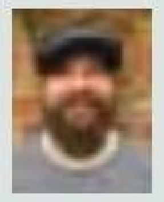
Editor
James Batchelor
jbatchelor@nbmedia.com

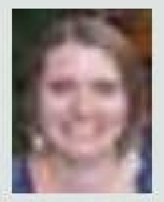

Deputy Editor
Craig Chapple
cchapple@nbmedia.com


Contributing Editor
Will Freeman
wfreeman@nbmedia.com

Group Sales Manager
Alex Boucher
aboucher@nbmedia.com


Sales Executive
Charlotte Nangle
cnangle@nbmedia.com


Graphic Designer
Andrew Sweetman
asweetman@nbmedia.com


Production Executive
Elizabeth Parker
eparker@nbmedia.com

Contributors
Alex Calvin, Alex Ward, John Broomhall, Lee Bradley, Nick Gibson

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